UWI
ST. AUGUSTINE CAMPUS

POSTGRADUATE

FACULTY OF SCIENCE & TECHNOLOGY

2021/2022

Regulations & Syllabuses

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HOW TO USE THIS HANDBOOK

The Faculty Handbooks (also known as Faculty Booklets) are available on the Campus website in PDF format at http://sta.uwi.edu/faculty-booklet-archive. The Handbooks include:

- Relevant **Faculty Regulations** – e.g. Admission Criteria, Exemptions, Progression, GPA, Leave of Absence, etc.
- Relevant **University Regulations** including the Plagiarism Regulations and Declaration Forms
- Other Information on **Co-Curricular** courses, **Language** courses and **Support for Students** with physical and other disabilities or impairments.
- **Programme Descriptions and Course Listings** which include the list of courses to be pursued in each programme (degrees, diplomas and certificates), sorted by level and semester; course credits and credits to be completed for each programme – majors, minors and specials.
- **Course Descriptions** which may include details such as prerequisites and methods of assessment.

Students should note the following:
The Regulations and Syllabuses issued in the Faculty Handbooks should be read in conjunction with the following University Regulations:

- The Undergraduate Regulations and Syllabuses should be read in conjunction with the University Regulations contained in the Undergraduate Handbook and the University's Assessment Regulations (with effect from August 2018).
- The Postgraduate Regulations and Syllabuses should be read in conjunction with the University Regulations contained on the Postgraduate Admissions website and the Board for Graduate Studies and Research Regulations for Graduate Certificates, Diplomas and Degrees (with effect from August 2018).

Progress through a programme of study at the University is governed by Faculty Regulations *and* University Regulations. Should there be a conflict between Faculty Regulations and University Regulations, **University Regulations shall prevail, where appropriate**.

DISCLAIMER – PROGRAMMES & COURSES

Notwithstanding the contents of Faculty Handbooks, course outlines or any other course materials provided by the University, the University reserves the right at any time to altogether withdraw or modify programmes or courses as it deems necessary.

DISCLAIMER – PRIZES & AWARDS

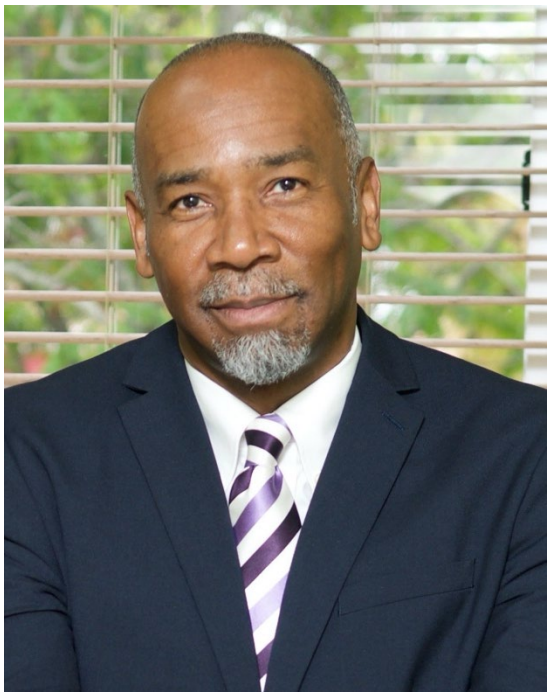
In the case where Faculty/Student Prizes or Awards may be listed, the Faculty does not bind itself to award any or all of the listed prizes/awards contained herein or its stated value and reserves the right to modify or altogether remove certain prizes/awards as described in either or both the electronic and printed versions of the Faculty Handbooks.

ACADEMIC CALENDAR 2021/2022

Get important dates such as the beginning and end of each semester, matriculation, examinations, graduation and ELPT. Also take note of deadlines for the payment of fees, registration, and applications for overrides, leave of absence, admissions, and scholarships & bursaries.

To download the latest calendar, visit https://sta.uwi.edu/registration/academiccalendar.asp

MESSAGE FROM THE DEAN



Welcome to the Faculty of Science & Technology (FST), The University of the West Indies, St. Augustine. We share in your excitement at having chosen the FST for your postgraduate training. This Faculty has a strong tradition and culture of research, innovation and development. We offer a range of postgraduate diplomas, MSc, MPhil, and PhD degrees in disciplines such as Mathematics, Physics, Chemistry, Computer Science, Environmental Science, and Biological Sciences.

The FST at the St Augustine Campus is the most diverse faculty in terms of academic programmes offered. We offer highly qualified and competent academic, administrative, technical and support staff, as well as state-of-the-art laboratories. We have world-renowned academic staff and some of them were actually postgraduate students at The UWI. We recognise that postgraduate students are the lifeblood of research and innovation in our Faculty and encourage you to develop new, creative and interesting ideas and to acquire a range of complementary technical competencies. We are committed to supporting you in this effort and offer you postgraduate training that is second to none.

Our Faculty consists of five departments: Chemistry, Computing & Information Technology, Life Sciences, Mathematics & Statistics, and Physics. Additionally, the Seismic Research Centre is affiliated with the FST. This booklet contains important information on our various postgraduate programmes and courses and we encourage you to become very familiar with it.

The FST provides postgraduate students with an intellectually stimulating atmosphere conducive to the development of critical thinking skills and research. For MPhil and PhD degrees, we encourage prospective students to play active roles in identifying their research interests and choosing supervisors and advisory committees. We look forward to your regular participation in research seminars by your fellow students, staff and visiting scientists. We welcome your contribution to the intellectual climate within the faculty.

On behalf of the staff of the FST, I wish you a very warm welcome and success in your chosen higher degree. I also wish you an enjoyable stay in our Faculty and hope that you would have a thoroughly satisfying experience and look back on these years as representing the most stimulating, productive and rewarding time of your life.

Dr Brian N. Cockburn
DEAN

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UNIVERSITY REGULATIONS
GRADUATE CERTIFICATES, DIPLOMAS AND DEGREES

All New Postgraduate Students, post-August 2021, will be governed by the GS&R regulations amended for including GPA.

All Continuing Students, pre-August 2021 will be governed by the appropriate non-GPA regulations.

Please see the **Implementation of the Postgraduate GPA System** section below for more details.

PLAGIARISM

University Regulations on Plagiarism can be found in Appendix 1 using this link.

IMPLEMENTATION OF THE POSTGRADUATE GPA SYSTEM

Information for both NEW and CONTINUING students
First published August 2021. Updated October 2021.

As part of continued efforts to align the standards of The UWI more closely with international norms and best practice, a Grade Point Average (GPA) system will be introduced with effect from the 2021/2022 academic year.

Will the new PG GPA apply to all postgraduate students and programmes?

No. It applies **ONLY** to students who were admitted and commenced **TAUGHT** postgraduate programmes (see exclusions below) **in or after** the **2021/2022 academic year**, referred to below as "New (GPA) Students". Taught postgraduate programmes refer to postgraduate certificates and diplomas, masters and professional doctorates, with some exclusions (see below).

It does **NOT** apply to **ANY** students admitted to postgraduate programmes (taught or research) **prior** to the **2021/2022 academic year**, referred to below as "Continuing (non-GPA) Students".

*Please remember that each student is bound by the regulations in force **on the date of admission to their programme**, as stated in their Faculty's Regulations Handbook published in that year. To find your applicable handbook, visit https://sta.uwi.edu/faculty-booklet-archive.*

Excluded Programmes

The new PG GPA system does **NOT** apply to students pursuing the following:

i. Research degrees (MPhil and PhD degrees) – all campuses
ii. Doctor of Medicine (DM) programme – all campuses
iii. Diploma in Family Medicine and Diploma in Emergency Medicine (DM) – all campuses
iv. Master of Fine Arts (MFA) – St. Augustine Campus

Exemptions & Variations

Exemption/variations within the application of the new PG GPA system will be applied to the following areas and programmes in the Faculty of Humanities and Education:

i. The Master's in Fine Arts (MFA) in Creative Writing – ***Exemption***
ii. The MA Spanish (Research Paper – SPAN 6009) – ***Variation***
iii. The Diploma in Education (Practicum Paper – EDTP 5002) – ***Variation***
iv. The Master's in Education – ***Variation***

How will Continuing (non-GPA) Students be affected?

Continuing students at the St. Augustine Campus need to be aware of the introduction of new Course Registration Numbers (CRN) to be used by new students only (see Changes to the Registration Process below). Otherwise, there are no changes for continuing students.

How will New (GPA) Students be affected?

- GPA is a representation of student performance on transcripts.
- Whether you pass a course or not, the quality points earned still count towards your GPA, meaning that all your efforts are considered.
- Quality points are earned even if students do not reach the threshold of a pass with coursework and/or final exam.
- If a student fails a single course twice, an automatic Required to Withdraw (RTW) will no longer apply.
- A student is not required to earn a 'Distinction' for their research projects in order to receive an overall 'Distinction'.
- An additional award category of 'Merit' has been introduced along with 'Pass' and 'Distinction' (see Award of Degrees below).
- It allows more efficient performance tracking, for both students and faculty.
- It provides a measurement of academic performance that makes for easy comparison by other international universities for the purposes of transfer and admission.

What does the PG GPA look like?

The introduction of the PG GPA follows the successful introduction of the GPA system at the undergraduate student level in 2003/2004. The grade bands for the PG GPA system are almost identical to those for the undergraduate GPA, except for the introduction of a new band – FCW/FWE, which is described below.

GRADE	Grade Point	% Range	Grade Definition	Grade Descriptor
A+	4.30	90 - 100	Exceptional	Demonstrates exceptional performance and achievement in all aspects of the course. Exceptional application of theoretical and technical knowledge that demonstrates achievement of the learning outcomes. Goes beyond the material in the course and displays exceptional aptitude in solving complex issues identified. Achieves the highest level of critical, compelling, coherent and concise argument or solutions within the course.
A	4.00	80 - 89	Outstanding	Demonstrates outstanding integration of a full range of appropriate principles, theories, evidence and techniques. Displays innovative and/or insightful responses. Goes beyond the material with outstanding conceptualisation which is original, innovative and/or insightful. Applies outstanding critical thinking skills.
A-	3.70	75 - 79	Excellent	Demonstrates excellent breadth of knowledge, skills and competencies and presents these in appropriate forms using a wide range of resources. Demonstrates excellent evidence of original thought, strong analytical and critical abilities; excellent organisational, rhetorical and presentational skills.
B+	3.30	70 - 74	Very Good	Demonstrates evidence of very good critical and analytical thinking in most aspects of the course. Very good knowledge that is comprehensive, accurate and relevant. Very good insight into the material and very good use of a range of appropriate resources. Consistently applies very good theoretical and technical knowledge to achieve the desired learning outcomes.
B	3.00	65 - 69	Good	Demonstrates good knowledge, rhetorical and organisational skills. Good insight into the material and a good use of a range of appropriate resources. Good integration of a range of principles, techniques, theories and evidence.
B-	2.70	60 - 64	Satisfactory	Displays satisfactory evidence of the application of theoretical and technical knowledge to achieve the desired learning outcomes. Demonstrates sound organisational and rhetorical skills.
C+	2.30	55 - 59	Fair	Demonstrates fair breadth and depth of knowledge of main components of the subject. Fair evidence of being able to assemble some of the appropriate principles, theories, evidence and techniques and to apply some critical thinking.
C	2.00	50 - 54	Acceptable	Demonstrates acceptable application of theoretical and technical knowledge to achieve the minimum learning outcomes required in the course. Displays acceptable evidence of critical thinking and the ability to link theory to application.
FCW/FWE	1.70	40 - 49		Fail Exam/Fail Coursework

F1	1.70	40 - 49	Unsatisfactory	Demonstrates unsatisfactory application of theoretical and technical knowledge and understanding of the subject. Displays unsatisfactory ability to put theory into practice; weak theoretical and reflective insight. Unsatisfactory critical thinking, organisational and rhetorical skills.
F2	1.30	30 - 39	Weak	Weak overall performance with very limited knowledge and understanding of the subject. Little evidence of theoretical and reflective insights. Weak organisational and rhetorical skills.
F3	0.00	0 - 29	Poor	Overall poor or minimal evidence of knowledge and understanding of the subject. Displays little ability to put theory into practice; lacks theoretical and reflective insights. Incomplete breadth and depth of knowledge on substantive elements of the subject. Little or no evidence of critical engagement with the material. Responses are affected by irrelevant sources of information, poor organisational and rhetorical skills.

Changes to the Registration Process

As the GPA system is phased in, we will have two categories of students (new GPA and continuing/legacy (non-GPA) registering for the same courses. The difference will be reflected in the course registration number (CRN) for each course.

When registering for courses, you will see two sets of CRN codes – one for continuing (non-GPA) students, and another for new students registering under the GPA system. All other course information is the same. Only the CRNs are different.

Please pay careful attention and use the codes that correspond with your status as either a new or continuing student. The Banner registration system has been set up to deal with this duality, and once grades are input via the Banner Software, GPA is calculated automatically.

For more on the registration process and to see the updated CRN codes and instructions, download the Online Registration Guide.

Award of Degrees

New students entering participating taught programmes in the 2021/2022 academic year as detailed above will be assessed and awarded degrees based on the Postgraduate GPA grading scale as follows:

GPA	CATEGORY
≥3.70	Distinction
3.30 – 3.69	Merit
2.00 – 3.29	Pass
< 2.00	Fail

Please note that

- the award of degree is based on the overall programme GPA.
- research projects will be considered similarly to other courses, so for a student who does not earn a 'Distinction' in their research project, it is still possible to be awarded a 'Distinction' in their overall programme once their programme GPA is ≥3.70.
- if a student fails or repeats a course, they will still qualify for a 'Distinction' if their overall programme GPA is ≥3.70.
- special requirements apply for the award of 'High Commendation' to professional doctorates (see regulation 14).

Continuing students and new students entering **programmes that are currently excluded** will be assessed and awarded according to the non-GPA systems included in this booklet for students' convenience.

Where can I get help or find out more?

- Visit www.uwi.edu/postgradgpa to learn more and find answers to frequently asked questions about the postgraduate GPA system.
- To see the full regulations governing the PG GPA, download the GPA Regulations for Graduate Certificates, Diplomas, Taught Masters and Professional Doctorate Programmes.
- For answers to specific questions, contact the Office for Graduate Studies & Research online.

GENERAL INFORMATION ON POSTGRADUATE STUDIES IN THE FACULTY OF SCIENCE AND TECHNOLOGY

1. ROLE OF THE SCHOOL FOR GRADUATE STUDIES AND RESEARCH (SGS&R)

The School for Graduate Studies and Research has the overall responsibility for the development of graduate studies and research on all four campuses of The University of the West Indies. The School is chaired by its Pro Vice Chancellor (PVC, Graduate Studies) and is governed by the Board for Graduate Studies and Research. There is a committee of the SGS&R on each campus called the Campus Committee for Graduate Studies and Research. The SGS&R works closely through these four (4) Campus Committees to manage and administer activities related to research and graduate studies. The School assists academic departments with the maintenance and development of coherent graduate studies programmes and, through the Board for Graduate Studies and Research, approves the establishment of new postgraduate programmes and the award of degrees.

2. TYPES OF GRADUATE PROGRAMMES OFFERED IN THE FACULTY OF SCIENCE AND TECHNOLOGY

The Faculty offers a wide range of certificates, diplomas, taught Master's degree as well as research degrees (MPhil and PhD)

(a) Taught Programmes

The programmes for the Master of Science (MSc) degrees and for Postgraduate Diplomas consist mainly of a set of lectures, seminars, coursework assignments and either a project or a research paper. The Faculty also offers Diplomas and Certificates by distance.

(b) (i) Research Degrees

The Master of Philosophy (MPhil) and the Doctor of Philosophy (PhD) degrees are research degrees that primarily involve independent study, directed by one or more supervisors. All MPhil and PhD programmes of study culminate in the presentation of a thesis conveying the results of the independent study and research carried out by the graduate student. It is necessary that graduate students, supervisors, advisory committees and examiners ensure that the qualitative and quantitative distinction between the MPhil Degree and PhD Degree be understood and maintained.

(ii) The MPhil Thesis

The MPhil thesis reviews the state of knowledge in a particular field, creates and evaluates a new design or novel experiments in a particular aspect of an area of study or makes an appropriate critique or interpretation of the subject. The Master's thesis should be evidence of the graduate student's ability to effectively review the relevant literature in the field, to undertake independent research and to present the results in a clear, systematic and scholarly form.

It is normally expected that a Master's thesis will make some independent contribution to knowledge or understanding in the subject area in which the student is working.

(iii) The Doctoral Thesis

A Doctoral thesis must set forth a significant contribution to knowledge or understanding, adding to or critiquing through approved research methodologies the current theoretical underpinnings and empirical base in the student's field of study.

The thesis must be set forth in a scholarly manner demonstrating the original and independent investigations conducted and setting forth unambiguously its achievements, contributions and findings in a format appropriate to Doctoral Theses in the particular discipline.

The Doctoral Thesis must reflect not only mastery of the subject area under investigation and competence in research techniques, but also the ability to select an important problem for investigation and to deal with it in a mature, competent manner.

The Doctoral Degree is, by nature and tradition, the highest certificate of membership in the academic community. It is meant to indicate the presence of superior qualities of mind, intellectual interest and high attainment and knowledge in a chosen field. It is not conferred merely as a certificate for a prescribed course of study and research, no matter how faithfully pursued. Independent achievement at a high intellectual level is a prerequisite to its conferment. A Doctoral Thesis or parts thereof must be judged to be potentially publishable.

The award of a PhD also requires the candidate to defend his/her thesis at a public oral examination. Many research degrees now contain a taught element. The intention of these taught courses is to provide students with research techniques and skills that will not only help them complete their current research topic, but will also stand them in good stead for life after University.

With the exception of holders of MPhil degrees from recognised Universities, candidates interested in pursuing the PhD degree are normally required to register for the MPhil Degree in the first instance. If your Supervisors are happy with your progress, then provisions exist to upgrade your registration from the Master's to Doctoral level without first submitting a Master's dissertation.

If you decide to pursue a research degree, it is very important that the thesis topic you choose is of genuine and sustainable interest to you.

3. REGISTRATION

The academic year is divided into two (2) semesters as follows:

Semester I - August to December
Semester II - January to May

Candidates for the MPhil or PhD degree may register during the first two weeks of either Semester but it is more usual for such candidates to begin their studies at the start of the academic year. A candidate wishing to pursue a taught Master's Degree or an Advanced Diploma programme MUST begin his/her studies at the start of the academic year unless otherwise specified.

Students from Trinidad & Tobago may be registered for full-time or part-time studies. You will not be registered for full-time studies if you spend an average of twelve or more hours a week in paid employment. For a student registering as part-time, proof of leave of absence from your job must be submitted at the time of registration. Overseas students will normally be required to register as full-time studies.

No allowances will be made with respect to attendance at lectures, laboratories, tutorials or examinations for students on the condition of their employment.

4. TIME LIMITATION

The following table shows IN GENERAL the time limitation (in years) for postgraduate degrees:

	FULL TIME		PART TIME	
PROGRAMME	**Minimum**	**Maximum**	**Minimum**	**Maximum**
Diplomas	**1**	**---**	**2**	**---**
MSc (taught)	**1**	**2**	**2**	**4**
MPhil	**2**	**3**	**---**	**5**
PhD	**3**	**5**	**5**	**7**

5. ACADEMIC SUPERVISOR

Each research student is assigned one or more supervisors who will guide the student through his/her studies. The appointment of a supervisor(s) is recommended by the relevant Head of Department after careful consideration of the Faculty member's expertise and experience. Also, a Committee of Advisors shall be appointed by the Board for Graduate Studies and Research for each MPhil and PhD student. This Committee shall comprise a minimum of three persons, including the supervisor(s) of your research programme.

6. ASSESSMENT

a. Taught Programmes

The methods of assessment may vary, but examinations are conducted mainly by written papers supplemented by in-course testing, practical examinations, a project report, a research paper, or a combination of these methods.

Candidates are required to pass all courses and all coursework, designated by the Department as forming part of the higher degree programme for which they are registered, with a mark of 50% or better.

b. MPhil/PhD Thesis and Examination

All research degrees are examined by theses. In addition, research students will be required to pass courses amounting to a MINIMUM of 6 credits for the MPhil and 9 credits for the PhD degree. For the MPhil degree the candidate may be required to defend his/her thesis by an examination. Every candidate for the PhD must defend his/her thesis by an oral examination.

High commendation may be bestowed on a candidate for either the MPhil or the PhD degree where the Examiners are unanimous in their recommendation that such an award should be made.

A candidate who is unsuccessful in the examination for the PhD may apply to the Board for Graduate Studies and Research for transfer of registration to the relevant MPhil and for permission to resubmit the relevant thesis or a revised version of it for examination for a Master's degree. Where the application is approved, the registration for the PhD will lapse and the registration for the MPhil will be deemed to have started from the date of registration for the PhD.

7. UPGRADING OF REGISTRATION

Postgraduate students who are registered for the MPhil degree and who wish to be considered for the upgrading of their registration to PhD must apply to do so in the second year of registration on the written recommendation of their supervisor(s). Applications for upgrading will normally not be considered after the third year of registration. A supervisor must state why he/she considers the student to be outstanding and whether in his/her opinion the work can be developed to the level of the PhD. Applicants for upgrade must submit a written proposal outlining the work done to date and how they propose to develop this work into a PhD and must defend their proposal for upgrading at an open seminar convened for this purpose.

All recommendations from Departments for PhD upgrade registrations are subject to the approval of the Board for Graduate Studies and Research.

8. GRADUATE RESEARCH SEMINARS:

All postgraduate research students are required to present seminars as follows:
MPhil - at least two
PhD - at least three

These seminars will be examined and graded on a 'pass' or 'fail' basis. Students are also required to attend a minimum of 75% of all Departmental/Faculty seminars. A Seminar attendance register will be kept by all Departments.

GENERAL INFORMATION ON THE FACULTY OF SCIENCE & TECHNOLOGY

DEPARTMENTS IN THE FACULTY OF SCIENCE AND TECHNOLOGY

The Faculty consists of five (5) departments:

- Chemistry
- Computing and Information Technology
- Life Sciences
- Mathematics and Statistics
- Physics

PROGRAMMES

The Faculty of Science & Technology offers training at the graduate level in the Life and Physical Sciences with a wide range of practical and business applications from Environmental Sciences and Management to Information Technology, Computational Mathematics, Material Science, Molecular Biology, Alternative Energy, Medical Physics and Natural Products to name a few. A number of these programmes are multidisciplinary in nature and are done in conjunction with other Departments/Faculties. This training allows students to acquire the range of marketable skills essential in the light of globalisation. Postgraduate programmes in the following areas are currently offered:

POSTGRADUATE DIPLOMA:

- Biodiversity Conservation and Sustainable Development in the Caribbean (Offered by Distance Teaching)
- Postgraduate Diploma in Occupational and Environmental Safety and Health (OESH)
- Postgraduate Certificate in Occupational and Environmental Safety and Health (OESH)

MASTER OF SCIENCE (MSc) DEGREES:

- Biodiversity Conservation and Sustainable Development in the Caribbean (Offered by Distance Teaching)
- Biomedical Physics
- Biotechnology
- Computer Science and Technology
- Data Science
- Mathematics
- Occupational and Environmental Safety and Health
- Statistics
- Renewable Energy Technology

MASTER OF PHILOSOPHY (MPhil) AND DOCTOR OF PHILOSOPHY (PhD) DEGREES:

- Biochemistry
- Biotechnology (ACTT approved - Awaiting GATE approval)
- Chemistry
- Computer Science
- Environmental Biology
- Mathematics
- Microbiology
- Physics
- Plant Science
- Renewable Energy Technology
- Statistics
- Zoology

ENTRY REQUIREMENTS

Candidates seeking entry to the Diploma, or MSc, or MPhil programmes in the Faculty must satisfy the minimum requirements of the Board for Graduate Studies and Research (Lower Second Class Honours for MSc and Upper Second Class Honours or equivalent for MPhil) AND must hold a BSc degree at the prescribed level in Natural Sciences (or an equivalent qualification) from an approved University. In exceptional cases, students may be admitted with a pass degree and considerable work experience in a related area.

For direct entry into the PhD programme, a student must satisfy minimum entry requirements of the Board of Graduate Studies & Research AND have obtained a MPhil degree (or an equivalent qualification) in an appropriate field of study in science from an approved tertiary level institution.

THE CAMPUS LIBRARIES

THE UNIVERSITY OF THE WEST INDIES
ST. AUGUSTINE CAMPUS

The Campus Libraries support the teaching, learning and research activities of The University of the West Indies (UWI), St. Augustine Campus (STA) community. These libraries include:

- The Alma Jordan Library
- The Medical Sciences Library
- The Norman Girvan Library of The Institute of International Relations
- The Republic Bank Library and Information Resource Centre of the Arthur Lok Jack Global School of Business
- The School of Education Library
- The Patience-Theunissen Memorial Library of the Seminary of St. John Vianney & the Uganda Martyrs Theological Institute at Mt St Benedict, and
- The Seismic Research Centre Library.

Resources for Students

Each Library's website (https://libraries.sta.uwi.edu/) is the gateway to its comprehensive electronic, print and multimedia information resources. From there, students can access state-of-the-art, scholarly, full-text databases on and off campus. The specialised and constantly updated collections contain information relevant to all faculties, research centres, and institutes on Campus. They currently provide access to:-

- electronic resources: - 259 databases, 84,198 e-journal titles and 62,500 e-books;
- print resources: - over 500,000 books/monographs and 975 journal titles.

Moreover, a sizeable body of Caribbean research may be accessed from maps, microforms, newspapers, theses, photographs, oral history interviews, and over 150 special collections in the West Indiana and Special Collections Division.

Library Services

- traditional loan services
- personal and small group research consultations;
- reference assistance
- inter-library loan/document delivery
- dissertation/thesis checking
- web-based guides
- orientation tours
- year-round Information literacy sessions

Library Facilities

- audio-visual rooms
- computer laboratories
- photocopying and printing
- group study rooms
- areas for quiet study

Research Support

"***Ask Us***", an online chat service, provides users with immediate responses to questions in real-time with library staff. It is available from the AJL and the Medical Sciences Library websites only during the semester, Monday to Friday, from 10:00 a.m. to 4:00 p.m. Users can also submit queries and find answers in the ***Frequently Asked Questions*** here: http://uwi-sta.libanswers.com

The Institutional Repository, **UWISpace**, (http://uwispace.sta.uwi.edu/dspace/) facilitates the collection, preservation and distribution of the scholarly/research output of the University.

UWIScholar (https://uwischolar.sta.uwi.edu) is our research information management system designed to aggregate and manage researcher (faculty and students) profiles, and facilitate global networking and expertise discovery.

The Campus Libraries' **Dataverse** platform (https://dataverse.sta.uwi.edu/) allows researchers to archive and preserve datasets generated by their research activities.

The Libraries also provide services and software that enable UWI faculty, staff, and students to publish their own subscription and open-access online journals (https://journals.sta.uwi.edu/). These journals are published using Open Journals System (OJS), an open-source editorial management and publishing system, which can manage some or all of the stages of the journal publishing process including submissions, peer review, editing, online publishing, and indexing.

The AJL, in collaboration with the St. Augustine Centre for Innovation and Entrepreneurship (STACIE), and the Intellectual Property Office of the Ministry of the Attorney General and Legal Affairs provides an **Intellectual Property Help Desk Service** to help support researchers.

For further information on these resources and services, please refer to your Library's website or contact your Faculty Liaison Librarian:

Ms Joy Smith
Faculty Liaison Librarian (Food and Agriculture & Science and Technology)
Science and Agriculture Division, Floor 2
The Alma Jordan Library
Tel.: 662 2002, ext. 83596, 83359
Fax: 662-9238
E-mail: joy.smith@sta.uwi.edu
Alma Jordan Library: http://libraries.sta.uwi.edu/ajl

STUDENT LIFE AND DEVELOPMENT DEPARTMENT (SLDD)

A DIVISION OF STUDENT SERVICES AND DEVELOPMENT (DSSD)

The SLDD is the first and most important **source** for high quality academic and personal development support.

WHO CAN ACCESS THE SERVICES?

ANY student can access the services through self-referral or referrals by Faculty, Department, friend, family, etc. SLDD caters to the needs of Full-Time, Part-Time, Evening University, Postgraduate, Mature, External, international, regional and Undergraduate students, including student athletes and students with special needs (disabilities). We provide support for ***ALL*** students in areas such as:

GENERAL ACADEMIC SUPPORT - ALL STUDENTS

- Time management
- Examination strategies
- Workload management
- Study skills - LASSI (Study Skills)
- Peer tutoring
- Educational assessment – LADS (dyslexia)
- Referrals to Counselling

INTERNATIONAL AND REGIONAL STUDENT SUPPORT

- Assistance with Immigration matters.
- Peer pairing
- Liaising with faculties and departments regarding immigration matters

POSTGRADUATE AND MATURE STUDENT SUPPORT

- Financial assistance, peer tutoring, and examination invigilation.
- Referrals for graduate employment.
- Liaising with faculties and departments on postgraduate and mature student matters.

DISABILITY SUPPORT/SPECIAL NEEDS STUDENTS SUPPORT (TEMPORARY AND PERMANENT)

- Provision of aids and devices such as laptops, digital voice recorders, wheelchairs, walking canes and crutches.
- Special accommodations for examinations and Classroom accommodations.
- Liaison with faculties, departments, deans, heads of departments, and lecturers.
- Special parking accommodations- Accessible Parking Permits.
- Student Support Group.
- Assistive Technology Lab at the Alma Jordan Library- special software (JAWS).

No student of The UWI will be discriminated against on the basis of having special needs. Every effort will be made to facilitate your on-campus requirements in terms of mobility, coursework and examinations. Sharing your needs before registration will enable us to serve you better as a member of the Campus Community.

HOW DO I REGISTER AT SLDD?

- Collect a registration form from the SLDD office or download from https://sta.uwi.edu/dssd/student-life-and-development-department.
- Complete the registration form and submit to the office or via email to sldd@sta.uwi.edu.
- Students with disabilities and medical conditions must submit a medical report from a qualified medical professional.
- Schedule an appointment to meet with the Manager or a Student Support staff member.
- An assessment of the student's needs will be conducted to determine the required service.

For more information or assistance, contact:
Dr Jacqueline Huggins, Manager, SLDD
Address: Heart Ease Building, Wooding Drive, St. Augustine Campus
Tel: 662-2002 Exts. 83866, 83921, 83923, 84254 OR Direct line 645-7526
Hours: Monday to Friday | 8:30 am - 4:30 pm
SLDD Website: https://sta.uwi.edu/dssd/student-life-and-development-department
Facebook: https://www.facebook.com/UWI-Student-Life-Development-Department-SLDD-948337438614375

Never hesitate to get in contact with the SLDD at any time!

DEPARTMENT OF CHEMISTRY

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PROGRAMMES

MSC/MPHIL/PHD

The Department of Chemistry offers one taught master's programme leading to the MSc in Occupational and Environmental Health and Safety, as well as MPhil and PhD degrees by research in the areas of Natural Products, Inorganic and Materials Chemistry, Liquid Crystals, Environmental Chemistry and Waste Management, Bio-analytical Chemistry, Nuclear Magnetic and Nuclear Quadrupole Resonance Spectroscopy, Supramolecular Chemistry, Organic Synthesis, Microcalorimetric studies on Biological Systems, Photocatalysis and Corrosion Chemistry.

Students may register on a part-time or full-time basis. The Board for Graduate Studies and Research offers a limited number of scholarships to students of the highest academic standing registering for MPhil/ PhD Some Departmental funding, in the form of full-time demonstratorships, is available for registered MPhil/ PhD students not on scholarship.

RESEARCH INTERESTS

Topics which are currently being actively investigated by staff include:

- isolation and structure elucidation of Natural Products from terrestrial plants and marine organisms including synthesis and bioactivity testing;
- optical, electronic, magnetic and catalytic properties of organometallic complexes;
- solar cell materials;
- rational design and construction of supramolecular environmental monitoring and hazardous waste management and disposal;
- food safety;
- nuclear magnetic and quadrupole resonance studies of dynamic equilibria;
- calorimetric studies on biological systems;
- the preparation of carbohydrates and novel boron-based catalysts for organic synthesis;
- hydration processes in cement admixtures;
- investigation of aggregate structures in biological membrane models;
- virgin and waste polymer cracking in a fluidised-bed reactor
- microbial degradation and fate of xenobiotics in environmental systems;
- air quality monitoring
- endocrine disruptors in freshwater systems;
- corrosion chemistry;
- electroanalytical methods;
- carbohydrate synthesis;
- biological/biophysical chemistry;
- oxidation of methane;
- peptide chemistry; synthesis and optimisation of macrocylic pharmacophores as PPI inhibitors; passive permeability evaluation of Peptoids.
- biotransformation to produce novel chemical entities
- enzymes in ionic liquids;
- thermotropic phase behaviour of metal containing liquid crystal compounds;
- low temperature selective hydrocarbon oxidation
- photocatalysis (materials development, CO2 oxidation, water splitting)
- zeolite catalysis
- bio-renewable chemicals from agricultural waste
- petroleum chemistry - production and refining
- pollution prevention and remediation
- occupational health and safety

FACILITIES

The Department is well-equipped with laboratory space, computer facilities, and instrumentation to support research programmes. Instruments include:

- Gas, Liquid and Chromatographs;
- Setaram Modular TGA/DSC/DTA/TMA (up to 1700oC);
- Setaram micro DSC III microcalorimeter (with batch and continuous flow cells, heat capacity and flow mix cells);
- Two (2) Gamry high sensitivity modular electrochemical workstations for electrochemical and corrosion measurements;
- Home-constructed Taylor-Aris equipment for diffusion measurements;
- Bruker 300, 400 and 600 (cryoprobe) NMR spectrometers;
- FTIR (ATR), Diode-Array, and UV-VIS Spectrometers;
- Nuclear Quadrupole Double Resonance Spectrometer;
- GC- and LC-/Electron spray ionisation (ESI)-Time of Flight Mass Spectrometers;
- Rapid Stopped-flow Kinetic Spectrometer
- Perkin-Elmer Fluorescence Spectrometer
- Varian Atomic Absorption Spectrometer with graphite furnace;
- Perkin-Elmer Inductively Coupled Plasma Mass Spectrometer
- Jasco Model J-720 Spectropolarimeter;
- Olympus Phase Contrast and Polarising Microscopes;
- Veeco Multimode V Atomic Force Microscope/Scanning Electrochemical Microscope
- Linux cluster parallel supercomputer with GROMACS and GAUSSIAN and computational software
- KSV Langmuir-Blodgett apparatus

Chemistry Postgraduate Research Programme

Every MPhil/PhD student is required to pursue a minimum of two 4 credit courses. One of these is a general course for all students called introduction to Research Techniques in Chemistry (CHEM 6560) and the other course is one in the student's area of interest. In addition, each MPhil or PhD student is required to register for graduate research seminars two for the MPhil and three for the PhD.

The list of courses (4 credits each) offered by Chemistry Department for MPhil / PhD students:

COURSE CODE	COURSE TITLE
CHEM 6160	Metal - Organic Chemistry
CHEM 6161	Physico-Chemical Properties of Inorganic Complexes
CHEM 6260	Advanced Topics in Spectroscopy and Organic Synthesis
CHEM 6460	Advanced Topics in Analytical Chemistry
CHEM 6461	Advanced Topics in Bio-analytical Chemistry
CHEM 6560	Introduction to Research Techniques in Chemistry
CHEM 6561	Advanced Topics in Environmental Chemistry
CHEM 6562	Advanced Topics in Polymer Chemistry

MSc in Occupational and Environmental Safety and Health (OESH)

Recent developments in areas such as legislation, global trade and rapidly changing technology, have placed new expectations and demands of occupational and environmental safety and health on governments, environmental management, business enterprises, educational institutions, trade unions, workers and the public. Within this scenario, there is an urgent and growing need for the development of a cadre of professionals with competencies in Occupational and Environmental Safety and Health (OESH). Developed in 2005 in Mona, Jamaica, UWI's OESH Programme addresses the growing requirement for all employers, managers, supervisors, policy makers and public leaders to have a functional awareness of the key issues related to environmental and occupational safety and health. The Master of Science in Occupational and Environmental Safety and Health commenced at the St. Augustine campus in September 2009.

Objectives

The Master's programme is designed to prepare persons to function in key areas such as:
Enforcement - to ensure compliance, research and development, training, organisational systems and practice, policy and standards development.

Graduates would be able to develop, design, implement and manage complex OESH programmes and systems and to provide consultancy services and to educate others.

Entry Requirements

Applicants must have either a first degree or its equivalent in basic or applied sciences; candidates with any other BSc degree or equivalent such as a NEBOSH Level 6 Diploma, with suitable work experience will also be considered.

Delivery Mode

Intense, modular face-to-face and online sessions conducted on weekends and holidays, a few weekdays (when foreign lecturers are involved) and agreed evenings. Full-time practitioners in the OESH field are especially encouraged to apply.

The programme will be delivered by international, regional and local lecturers.

Course of Study

For the MSc in OESH, students are required to complete 34 credits of core courses and a research project of 9 credits as outlined below. Each 4-credit course consists of 48 hours of lectures and field visits and/or laboratory work where applicable. Full-time students will normally require 18 months and part-time students three years to complete the programme requirements. The full-time programme will normally consist of two semesters of coursework and examinations followed by the research project while the part-time programme involves four semesters of coursework and examinations followed by the research project.

Course Assessment:

This involves coursework, in-course tests and a three (3) hour written examination paper at the end of each semester.

Course Listing

YEAR I

SEMESTER 1 (17 CREDITS)

COURSE CODE	COURSE TITLE	CREDITS
OESH 6100	Advanced Environmental Health	4
OESH 6200	Advanced Occupational Safety and Health	4
OESH 6000	OESH and Public Policy	4
OESH 6600	Independent Study and Research Method	4
OESH 6300	Seminar	1

SEMESTER 2 (17 CREDITS)

COURSE CODE	COURSE TITLE	CREDITS
OESH 6030	Advanced Topics in OESH: OESH Disorders	4
OESH 6010	Advanced Topics in OESH: Measurement Methods and Ventilation	4
OESH 6040	Advanced OESH Management Systems	4
OESH 6050	Advanced Topics in OESH: Ergonomics	4
OESH 6300	Seminar	1

YEAR II

COURSE CODE	COURSE TITLE	CREDITS
OESH 6700	Research Project	9

Postgraduate Diploma in Occupational and Environmental Safety and Health (OESH)

Duration of Programme

- Two semesters (10 months) full-time or
- Four semesters (20 months) part-time (no summer courses)

Entry Requirements

- Bachelor Degree or equivalent in basic or applied sciences with a GPA of 2.5 and above. A Pass degree will also be considered from a University approved by the University of the West Indies
- NEBOSH Level 6 Diploma
- OESH Postgraduate Certificate from the University of the West Indies
- *Mature Entry* – 3-5 years' relevant experience in the field of health and safety. An interview will be required to determine the suitability of the candidate.

Course Listing

FULL-TIME STUDY

Semester I: (12 Credits)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5000	OESH and Public Policy	4
OESH 5100	Advanced Environmental Health	4
OESH 5200	Advanced Occupational Safety and Health	4

Semester II:(8 credits)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5030	Advanced Topics in OESH: OESH Disorders	4
OESH 5050	Advanced Topics in OESH – Ergonomics	4

PART-TIME STUDY

YEAR 1

Semester I: (8 Credits)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5100	Advanced Environmental Health	4
OESH 5200	Advanced Occupational Safety and Health	4

Semester II: (4 Credits – One of two courses)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5030	Advanced Topics in OESH: OESH Disorders	4
OESH 5050	Advanced Topics in OESH – Ergonomics	4

YEAR 2

Semester I: (4 credits)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5000	OESH and Public Policy	4

Semester II: (4 credits – One of two courses)

COURSE CODE	COURSE TITLE	CREDITS
OESH 5030	Advanced Topics in OESH: OESH Disorders	4
OESH 5050	Advanced Topics in OESH – Ergonomics	4

Postgraduate Certificate in Occupational and Environmental Safety and Health (OESH)

Duration of Programme

- Two semesters (10 months) part-time (No Summer Courses) or
- One semester (5 months full-time) (No Summer Courses)

Entry Requirements

- Bachelor's Degree or equivalent in basic or applied sciences with a GPA of at least 2.0 or a Pass degree.
- NEBOSH Level 6 Diploma
- Mature Entry – 3-5 years' relevant experience in the field of health and safety. An interview will be required to determine the suitability of the candidate.

Full-time Study

Semester I: (12 Credits– Compulsory)

COURSE CODE	COURSE TITLE	CREDITS
OESH 4000	OESH and Public Policy	4
OESH 4100	Advanced Environmental Health	4
OESH 4200	Advanced Occupational Safety and Health	4

Part-time Study

Semester I: (8 Credits - Compulsory)

COURSE CODE	COURSE TITLE	CREDITS
OESH 4100	Advanced Environmental Health	4
OESH 4200	Advanced Occupational Safety and Health	4

Semester II: (4 Credits – Electives)

COURSE CODE	COURSE TITLE	CREDITS
OESH 4030	Advanced Topics in OESH: OESH Disorders	4
OESH 4050	Advanced Topics in OESH – Ergonomics	4

DEPARTMENT OF COMPUTING AND INFORMATION TECHNOLOGY

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PROGRAMMES

MSC/MPHIL/PHD PROGRAMMES

The Department of Computing and Information Technology offers a taught Master's programme leading to the following:

- MSc in Computer Science and Technology, with Specialisations in (I) Cloud Technologies and (II) Mobile Computing.
- MSc in Data Science

The Department also offers MPhil and PhD research degrees on either a part-time or full-time basis. MPhil and PhD students are required to complete 6/9 credits of taught master's courses. Interested applicants are required to consult with the department to ensure that research facilities are available for their research area. The Board for Graduate Studies and Research offers a limited number of scholarships to students of the highest academic standing registering for MPhil/PhD.

Some departmental funding in the form of teaching assistantships and demonstratorships are available for registered MPhil/PhD students not on scholarship. The research areas are shown below.

RESEARCH INTERESTS

The current research in progress or research areas where activities are planned include:

1. APPLIED DATA SCIENCE:

- Applications in Insurance, Banking, Telecommunications, Logistics, Transport, Electrical Power, Manufacturing and Commerce
- Optimization of revenue, pricing, efficiency and marketing in various industries
- Solutions to Societal Problems (food security, carbon emissions, personal safety)

2. WIRELESS AND MOBILE COMPUTING

- Mobile software: design and application in educational and other areas, e.g. agriculture
- Enabling technologies include Bluetooth and SMS

3. DISTRIBUTED SYSTEMS

- The design and performance of Internet based distributed systems, especially those based on pessimistic and optimistic protocols

4. ARTIFICIAL INTELLIGENCE

- Mainstream high-performance-computing for artificial intelligence research and applications
- Application of artificial intelligence to the resolution of real-world problems

5. e-LEARNING:

- Encompassing all aspects of the use of computer technology to facilitate education, particularly web-based instructional systems
- Integrating web-based and classroom teaching in secondary schools and the Caribbean
- Aggregating and sequencing XML reusable learning objects in a peer-to-peer system
- Educational data mining (Moodle plug-in)
- Computer supported collaborative learning
- Accessibility for visually impaired
- Mobile application

6. DATA MANAGEMENT AND DATAMINING: *particularly applied to agriculture, energy sector, poverty monitoring.*

- Database systems, optimisation, data warehousing/data mining
- Big data

7. GEOGRAPHIC INFORMATION SYSTEMS

- Developing social simulations using multi agent simulations and GIS techniques for further understanding of the topical issues in the Caribbean, for example, urban planning, crime, and migration patterns in relation to social development policy

8. DECISION SUPPORT SYSTEMS AND GEOGRAPHICAL INFORMATION SYSTEMS

- Development of theoretical decision models to solve spatial multiple criterion problems

9. COMPUTER SECURITY AND WATERMARKING

- Developing digital watermarking techniques

10. SOFTWARE ENGINEERING

- Embedded systems
- Development of timetabling solutions

11. USABILITY, PERSONALISATION AND EMOTIVE DESIGN

Research on usability, personalisation and emotive (user emotions) design based on modern mathematical models (computational intelligence: fuzzy logic, neural networks, swarm optimisation, etc.) is carried out at the Caribbean's first Usability Lag at the Department of Computing and Information Technology. Its multidisciplinary areas are, as follows:

- User-experience design and development: user-experience design and development of Interactive systems/products/workplaces like websites, eServices, mobile devices, office workplaces.
- Usability Testing: usability tests In the Caribbean's first Usability Lab for interactive systems/products/workplaces.
- Personalisation: design and development of user-adapted/personalised interactive systems and products.
- Emotive design: research on user emotions/affect/mood/enjoyability issues in design and development of interfaces/systems/products/workplaces that adaptively and positively appeal to the emotions of the user. Use of advanced technologies for recognition of emotion-based on facial expressions, EEG, ECG,

12. MOBILE HEALTH

- Mobile telemedicine for patients suffering from diabetes and cardiovascular disease in the Caribbean

MSc in Computer Science and Technology with Specialisations in Mobile Computing and Cloud Technologies

Objectives

The objectives of this revised programme are to:

- Produce students who are better equipped for present and future ICT careers by teaching them to not only understand present technologies but also be able to learn and adapt as technologies continue to change. This will be achieved through more design-based assignments and less traditional solution-based assignments.
- Achieve better integration of theory and practice through classroom presentations of theory followed by laboratory exercises.
- Take advantage of the rapid changes in education due to the Internet.
- Introduce a sustainable self-financed programme and hence reduce the financial burden on the UWI
- Have a more focused programme so that we offer fewer, more expertly taught courses. The areas of focus can be modified as the needs of the community vary.
- Share common courses within the campus to more efficiently utilise human resources.

Entry Requirements

To be admitted to this programme a candidate should possess a BSc degree in Computer Science or a major in Computer Science or equivalent (with a minimum GPA 2.5) with a minimum average of B+ (3.0) in any two (2) of the following courses or equivalent.

COURSE CODE	COURSE TITLE
COMP 2603	Object Oriented Programming I
OR	
COMP 2500	Object Oriented Programming
COMP 2604	Operating Systems
OR	
COMP 3100	Operating Systems
COMP 2611	Data Structures
OR	
COMP 2000	Data Structures
COMP 3601	Design and Analysis of Algorithms
OR	
COMP 3000	Design and Analysis of Algorithms

Candidates without the above may be considered for entry upon successful completion of qualifying courses. These qualifying courses will be chosen by the programme coordinator for each such candidate based on their background and their intended area of specialisation.

Examination

Students will be required to pass both the coursework and the written examination. The pass mark is 50%. The grading scheme for graduate degrees is as follows: A 70 - 100%; B+ 60-69%; B 50-59%. In the case of the Research Project, evaluation will be based on the project report.

Award of Degree

To qualify for the award of the degree, candidates must pass all six (6) core courses, four elective courses and the Research Project. The degree shall be awarded in two categories - Distinction and Pass. For the award of the degree with distinction, the candidate must have obtained an average mark of 70% or more, across all core courses and elective courses as well as 70% or more in the Research Project. A candidate failing a course shall be ineligible for the award of distinction.

Prizes

The Teleios Systems Ltd Prize is awarded to the candidate with the best MSc Research Project in Computer Science.

Course of Study

For the MSc in Computer Science and Technology programme with specialisations in Cloud Technologies and Mobile Computing, students are required to complete a set of core courses, elective courses and a research project. The core courses will cover material that is essential for any Computer Science graduate while the elective courses will be offered in the areas of specialisation. Students would also be required to take a course on research methods that will help them with their research project. The research project will be a major component of the degree and will be required to be in the area of specialisation of the student. Each student must take a total of 39 credits consisting of 18 core course credits, 12 elective course credits and a 9-credit research project. Students will also be required to prepare at least one conference paper (submission of which will be left up to the supervisor). A wider audience will read this condensed version of their research project.

Full-time students will have to take 5 courses per semester and do their research project during the summer following their second semester. Part-time students can take 2-3 courses per semester and start their project once their courses are complete.

Specialisations

Each specialisation will consist of four elective courses. Students who have opted for the specialisation must pass all four electives in order to graduate. All four courses in each specialisation will be offered within each academic year. The areas of specialisation were chosen based on the expected ICT needs of Trinidad and Tobago and the Region in the coming years. They are Cloud Technologies and Mobile Computing.

Cloud Technologies: This specialisation is geared toward those students wishing to pursue careers in Information Systems, Database Management, Cloud Computing and Cloud Storage.

Mobile Computing: This specialisation is geared toward students wishing to work in the wireless communications industry, either as network designers or as application developers.

CORE COURSES (3 CREDITS EACH)

COURSE CODE	COURSE TITLE	CREDITS
COMP 6401	Advanced Algorithms	3
COMP 6501	Research Methods, Entrepreneurship and Intellectual Property	3
COMP 6601	Distributed Computer Systems	3
COMP 6701	E-Commerce and M-Commerce Systems	3
COMP 6801	Network and Computer Security	3
COMP 6104	Advance Computer Networks	3
COMP 6960	Research Project	3

ELECTIVE COURSES (3 CREDITS EACH)

Cloud Technology Specialisation Courses

COURSE CODE	COURSE TITLE	CREDITS
COMP 6300	Advanced Internet Technologies	3
COMP 6901	Software Project Engineering and Management	3
COMP 6802	Distributed and Parallel Database Systems	3
COMP 6905	Cloud Technologies	3

Mobile Computing Specialisation Courses

COURSE CODE	COURSE TITLE	CREDITS
COMP 6910	Wireless Networks	3
COMP 6915	Mobile Applications	3
COMP 6920	Mobile Computing	3
COMP 6925	Applied Operations Research	3

MSc in Data Science

Objectives

The objectives of this programme are to:

- Produce students who are equipped for present and future jobs in fields such as Data Science, Data Analytics, Machine Learning, Big Data, Business Intelligence and Operations Research.
- Better integrate theory and practice through classroom presentations of theory followed by laboratory exercises and projects.
- Produce graduates with an in-depth knowledge of Data Analytics.
- Produce graduates with knowledge of Process Optimisation and Operations Research.
- Produce graduates capable of pursuing advanced research in Data Analytics.
- Produce graduates who can formulate models for real-world problems and solve them.
- Produce graduates with an entrepreneurial spirit.

Entry Requirements

The minimum requirement for admission shall be a minimum GPA of 2.5 or a Lower Second Class Honours degree or its equivalent in Computer Science, Statistics or a related field, unless the Campus Committee for Graduate Studies and Research in any particular case otherwise decides.
The applicant should also have a basic knowledge of the following areas:

(a) Computer Programming

(b) Introductory Statistics

(c) Introductory Linear Algebra

Candidates without the above background who have at least an Upper Second Class Honours degree from UWI, or its equivalent, or significant work experience in the area, are still encouraged to apply. They will be considered for entry upon successful completion of qualifying courses. The programme coordinator will choose qualifying courses for each candidate based on their academic and work backgrounds.

Course of Study

The MSc in Data Science will consist of a set of core courses, elective courses and a research project. The core courses will cover material that is essential for any Data Science graduate while the elective courses will be chosen from presently offered MSc programmes. Students will also be required to take a course on research methods that will help them with their research project. The research project will be a major component of the degree.

Each student must take a total of 39 credits consisting of 18 core course credits, 12 elective course credits and a 9-credit research project.

Core Courses

Six 3-Credit Courses + 9-Credit Project = 27 Credits

The core courses have been chosen to satisfy the data science needs of the country while at the same time providing sufficient theoretical content for those wishing to pursue more advanced degrees.

- Full-time students will have to take 5 courses per semester and do their research project during the summer following their second semester.

- Part-time students can take 2-3 courses per semester and start their project once their courses are complete.

SEMESTER 1

COURSE CODE	COURSE TITLE	CREDITS
COMP 6501	Research Methods, Entrepreneurship and Intellectual Property **Assessment: Reports (60%) Presentations (30%) Participation (10%)**	3
COMP 6925	Applied Operations Research **Assessment: Coursework (50%) Final (50%, 2hrs)**	3
STAT 6105	Probability and Statistical Methods for Data Analytics **Assessment: Coursework (50%) Final (50%, 3hrs**)	3

SEMESTER 2

COURSE CODE	COURSE TITLE	CREDITS
STAT 6106	Statistical Inference for Data Analytics **Assessment: Coursework (50%) Final (50%, 3hrs)**	3
COMP 6930	Machine Learning and Data Mining **Assessment: Coursework (50%) Final (50%, 3hrs)**	3
COMP 6940	Big Data and Visual Analytics **Assessment: Coursework (50%) Final (50%, 3hrs)**	3

SUMMER

COURSE CODE	COURSE TITLE	CREDITS
STAT 6005	Research Project **Assessment: Project (100%)**	9

Elective Courses

Four 3-Credit Courses = 12 Credits

Four electives courses are required. The student must choose these from the following with the condition that at least one must be chosen from each of the disciplines (COMP and STAT).

COURSE CODE	COURSE TITLE	CREDITS
COMP 6300	Advanced Internet Technologies	3
COMP 6401	Advanced Algorithms	3
COMP 6802	Distributed and Parallel Database Systems	3
COMP 6905	Cloud Technologies	3
STAT 6160	Data Analysis	3
STAT 6170	Multivariate Analysis	3
STAT 6181	Computational Statistics I	3
STAT 6182	Computational Statistics II	3

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PROGRAMMES

MPhil and PhD

Biochemistry
Biotechnology
Environmental Biology
Microbiology
Plant Science
Zoology

Applicants to the MPhil or PhD research programme, should liaise with their potential supervisor for guidance in developing a clear research project and research proposal, which must be submitted to the Head of Department. Guidelines for the preparation of a research proposal are available at https://sta.uwi.edu/fst/lifesciences/documents/researchproposal.pdf. Supervisors listed in the application form should have agreed to do so.

RESEARCH INTERESTS AND FACILITIES

The Department has a long history of research and development projects in a range of research topics and especially as they relate to sustaining our populations and overall human wellbeing. Presently, the Department specialises in a number of innovative and dynamic areas of research and development. These include:

- Biodiversity -terrestrial, freshwater and marine
- Ecosystem services- -terrestrial, freshwater and marine
- Conservation biology--terrestrial, freshwater and marine
- Natural resources management- -terrestrial, freshwater and marine)
- Pollution, impacts and management, - -terrestrial, freshwater and marine
- Climate change vulnerability, impacts and adaptation -terrestrial, freshwater and marine
- Genetics
- Biotechnology
- Molecular biology
- Physiology and metabolism of tropical plants
- Tuberisation, abscission and mechanisms of resistance to pests and pathogens
- Microbiology and Crop Protection
- Epidemiology and control of diseases of public health importance

While the research focuses on providing new knowledge, studies are on-going in the traditional disciplines such as Biochemistry, Botany, Zoology, Marine and Freshwater Ecology and Epidemiology.

The Department has supporting specialist research laboratories in Biotechnology and Tissue Culture, Entomology, Environmental Biology, Marine and Freshwater Ecology, Parasitology, Ecotoxicology, Biosystematics, Biochemistry, Histology and Microbiology. The Department also maintains the National Herbarium, the Zoology Museum, the Land Arthropod Collection and several greenhouses.

Postgraduate students' projects are a major component of the Department's research programme, mainly at the MPhil and PhD levels, and also at the MSc level.

MSc/PG Diploma in Biodiversity Conservation & Sustainable Development in the Caribbean

The online graduate degree in Biodiversity Conservation and Sustainable Development in the Caribbean is a taught programme geared towards building and strengthening capacity in environmental management, biodiversity conservation and sustainable development in the Caribbean. The programme will be offered in two forms, Graduate Diploma and MSc and can be undertaken either on a full-time or part-time basis. Teaching on this programme will involve a blend of internet-based distance teaching and face-to-face training.

Objectives

The main objective of this graduate degree is to supply the region with qualified professionals who have a comprehensive knowledge of the concepts and principles of a wide range of science and environmental management issues related to tropical biodiversity. Advanced practical skills in environmental monitoring, impact analysis, environmental management, data management and policy issues will be taught in this programme. In addition, a working knowledge and appreciation of the major disciplines within environmental science and a multidisciplinary overview of environmental data collection and analysis together with an acquired and improved range of transferable skills including group work, scientific research, data analysis, report writing and oral presentation, will be provided to learners in this programme. As such it will provide students with a set of skills that will allow them to advance their careers in the environmental management and biodiversity conservation fields within their government, public sector, NGOs and industrial organisations.

Entry Requirements

Candidates applying for admission are required to satisfy the relevant general regulations of the Faculty and the University's Board for Graduate Studies and Research. The prerequisite for entry into the programme is a bachelor's degree in one of the following disciplines: natural sciences, engineering, agricultural sciences, geography, education or an appropriate social sciences from an approved university, with at least lower second-class honours or a minimum GPA 2.5 (or equivalent qualification and work experience).

Duration

Students enrolled in the Diploma Programme will be required to complete the course in either 1 year (full-time) or 2 years (part-time).

Students enrolled in the MSc Programme will be required to complete the degree in 1½ years (full-time) or 3 years (part-time).

Modes of Delivery

As a post-graduate Diploma/MSc level course, a variety of methods of delivery will be employed, which include face- to-face interactions, virtual seminars, tutorials, field visits and a research project. This will be supported by distance learning and e-based course assignments as well as project and scenario based workshops, case studies and assignments in which group work and student-centred learning approaches are adopted. Thus, increasing onus will be put on the student to take responsibility and control of their own learning. This will lead to the point of the final research project in which the student will be responsible for the development, management and reporting of a study with the supervisor acting as an advisor and facilitator. Additionally, the programme aims to maximise access by professionals working in government, NGO and commercial organisation by supporting face-to-face sessions with distance learning, assignments etc. which students can undertake from their home.

Course Assessment

A variety of course assessment techniques will be utilised throughout the programme.

Research Project

A Research Project is a fundamental component of the MSc programme and this is reflected, not only in the credit weighting, but by the fact that the MSc runs for an extra 6 months so that the student may have the necessary time to complete the project to a high standard.

The aim of the research project is to allow the student to synthesise and articulate several aspects of the taught programme within a single themed research topic. In addition, it will provide the opportunity for further detailed skills training in specific aspects of environmental monitoring, assessment or management of tropical biodiversity. It will allow the student to pursue an individual study on a particular research topic or issue of interest to the student and will incorporate technical skills training specific to the individual student. As such, the research project will provide the opportunity to develop a specific set of practical and reporting skills that will be of use to the student in their future career.

Award of Diploma/Degree

In this joint Diploma/MSc, the main awarding University will be the University delivering the most teaching to the specific student. Thus, prospective students should note that their degree will be awarded based on the number of credits taught by the various partner institutions.

Diploma in Biodiversity Conservation and Sustainable Development in the Caribbean

The Diploma programme consists of 24 credits and students will be required to complete any seven (7) core courses and one (1) of the options in order to successfully complete it. Each course carries 3 credits.

CORE COURSES

COURSE CODE	TITLE	CREDITS
BIOL 5200	Characteristics of Biodiversity	3
BIOL 5201	Threats to Tropical Biodiversity	3
BIOL 5205	Principles and Practice of Geoinformatics	3
BIOL 5206	Management and Analysis of Environmental Data	3
BIOL 5208	Conservation and Management of Biodiversity	3
BIOL 5210	Field Practicum	3
BIOL 5214	Environmental Resources Policy	3

OPTIONS

COURSE CODE	TITLE	CREDITS
BIOL 5202	Environmental Law and Multilateral Environmental Agreements	3
BIOL 5203	Environmental Economics	3
BIOL 5204	Environmental Impact Assessment	3
BIOL 5207	Sustainable Use and Management of Natural Resources	3
BIOL 5209	Pollution and Ecotoxicology	3
BIOL 5212	Taxonomy and Biodiversity Informatics	3
BIOL 5215	Socio-ecology and Natural Resources Management	3

MSc in Biodiversity Conservation & Sustainable Development in the Caribbean

The MSc programme consists of 45 credits.
Students will be required to complete the following courses:

- Seven 3-credit core courses and one 12-credit Research Project (BIOL 6211)
- Four Optional 3-credit courses

CORE COURSES

COURSE CODE	TITLE	CREDITS
BIOL 6200	Characteristics of Biodiversity	3
BIOL 6201	Threats to Tropical Biodiversity	3
BIOL 5205	Principles and Practice of Geoinformatics	3
BIOL 6206	Management and Analysis of Environmental Data	3
BIOL 6208	Conservation and Management of Biodiversity	3
BIOL 6210	Field Practicum	3
BIOL 6214	Environmental Resources Policy	3
BIOL 6211	Research Project	12

OPTIONS

COURSE CODE	TITLE	CREDITS
BIOL 6202	Environmental Law and Multilateral Environmental Agreements	3
BIOL 6203	Environmental Economics	3
BIOL 6204	Environmental Impact Assessment	3
BIOL 6207	Sustainable Use and Management of Natural Resources	3
BIOL 6209	Pollution and Ecotoxicology	3
BIOL 5212	Taxonomy and Biodiversity Informatics	3
BIOL 5215	Socio-ecology and Natural Resources Management	3

MSc/PG Diploma in Biotechnology

The development of a MSc and postgraduate diploma programme were conceived because of the urgent necessity of the UWI and the Caribbean region to immediately invest in biotechnology, which is considered to be the most promising and fastest-growing technology of the present era. The field of biotechnology is recognised for its potential to offer solutions to worldwide problems, from food security and health to clean energy and environmental sustainability. Situated in a strategic location, Trinidad and Tobago and rest of the Caribbean have the unique advantage to explore this growing global demand in biotechnology. This postgraduate programme will provide the basic expertise, skill sets, necessary infrastructure and knowledge base which would serve to ultimately build capacity in this region. It would create avenues for advanced research and enhance intellectual capacity to enable the development of industrial and business activity, leading to generation of employment opportunities in this frontier field. This programme will be offered at both the Post Graduate Diploma and the Master's levels.

Academic Aims and Objectives

This programme is intended to meet the needs of a broad range of professionals whose basic learning and knowledge are in life sciences, medicine and agriculture. The potential users of this programme would be natural and applied scientists, teachers, medical, paramedical and technical professionals. This is an entirely new programme and is designed to provide the basic learning, necessary skill sets, knowledge and hands-on experience in contemporary biotechnology which would ultimately contribute to the higher learning, capacity building and career advancement of enrolled users.

- To produce qualified biotechnologists with the competence to provide services to Medical Biotechnology, Agricultural Biotechnology, Industrial Biotechnology, Environmental Biotechnology and Bioinformatics and Biotechnology-based business development
- To build national and regional technological and infrastructural capacities for imparting terminal education, training and research on contemporary biotechnology
- To develop and foster collaborations with developed countries and institutes of Global excellence, facilitating the exchange of knowledge and development of cooperation in related industries
- To strategically prepare the Caribbean region to actively interact with the developing World in the Biotechnology services, research and development

Learning Outcomes

Students completing the programme would be able to:

- Demonstrate a comprehensive understanding of the latest theory and techniques of molecular biology, bioinformatics and biotechnology.
- Apply current tools of biotechnology to solve problems related to the environmental conservation, crop genetic improvement, nutrition, human and animal health; bioprocessing industries; environmental conservation.
- Develop practical industrial applications within existing industries or new venture (entrepreneurship) activities.
- Exercise individual judgment and initiative in biotechnological principles and applications.
- Analyse and appraise the social & environmental impacts of biotechnology.
- Establish new work programmes in the fields of biotechnology.
- Develop a research question in a specialised area of biotechnology and evaluate this research with appropriate justification.
- Compose, execute and present a suitable high-quality research project in biotechnology.

Entry Requirements

Admission requirements for this programme are as follows:

- First degree from a recognised University in Biology/Biochemistry/Agriculture or other Natural Sciences, Medicine and Veterinary Science with a minimum of Lower Second Class Honours.
- Significant work experience in a related field would be an asset.
- Candidates applying for the programme should have completed and secured a minimum "B" grade in at least three of the following Level II/III undergraduate courses or their equivalents (UWI-St. Augustine, Mona and Cave Hill or other recognised Universities/Colleges in the region/elsewhere):
    - Genetics
    - Microbiology
    - Molecular biology
    - Microbial Biotechnology
    - Plant Biotechnology
- Students successfully completing the Biotechnology minor/specialisation at UWI, St. Augustine or major at UWI, Mona would be eligible subject to fulfilment of the grade and GPA requirements
- Persons without adequate coverage of these areas may be required to pursue and pass (or at least 50% final marks) appropriate qualifying courses before admission into the MSc or diploma programme.
- Candidates not meeting the grade or GPA requirements but who have sufficient work experience in a relevant area may also be admitted under special circumstances. As part of the selection process, the department reserves the right to interview applicants for further exploration of their qualifications, experience and interest. They may be further required to complete minimum pre-requisite courses based on their needs as directed by the Programme Coordinator or Department Head.
- Students enrolled for the PG Diploma can apply to transfer to the MSc programme before completion of their coursework. Students granted permission to transfer would be required to pay the additional fees and complete the additional coursework.

Delivery

Lectures would be delivered via face-to-face and blended learning modes (e.g. WebEx) and available to students. All lectures, assignments, handouts, and review materials would be available online to all students registered under the programme. Lectures are supplemented with laboratory work and tutorials.

Programme Content and Structure

CORE COURSES (MSC/PGD Codes)

SEMESTER 1

COURSE CODE	COURSE TITLE	CREDITS
BIOT 6000/BIOT 5000	Molecular Biology and R-DNA Technology	3
BIOT 6001/BIOT 5001	Microbial and Environmental Biotechnology	3
BIOT 6003/BIOT 5003	Biotechnology and Health	3
BIOT 6007/BIOT 5007	Bioinformatics	3

SEMESTER 2

COURSE CODE	COURSE TITLE	CREDITS
BIOT 6002/BIOT 5002	Advances in Plant Genetic Engineering and Plant Biotechnology	3
BIOT 6004/BIOT 5004	Immunotechnology, Molecular Therapies and Diagnostics	3
BIOT 6005/BIOT 5005	Industrial Biotechnology and Bioprocessing	3
BIOT 6006/BIOT 5006	Bioethics, Biosafety and Intellectual Property Rights (IPR) in Biotechnology	3

SEMESTER 1/2

COURSE CODE	COURSE TITLE	CREDITS
BIOT 6014	Research Project (for MSc Students ONLY)	12

OPTIONAL COURSES
(MSC – Any 2 courses)
(PGD – Any 2 courses)

SEMESTER 2

COURSE CODE	COURSE TITLE	CREDITS
BIOT 6008/BIOT 5008	Genomics and Proteomics Technologies	3
BIOT 6010/BIOT 5010	Molecular Plant Breeding	3
BIOT 6011/BIOT 5011	Applied Bioinformatics	3
BIOT 6012/BIOT 5012	Directed Reading and Seminar	3
BIOT 6013/BIOT 5013	Entrepreneurship in Biotechnology	3

Credits

The proposed MSc programme comprises 42 compulsory credits:

- Eight (8) core courses (3 credits each)
- Two (2) optional courses from 5 (3 credits each)
- Research Project (12 credits)
-

The Postgraduate Diploma programme would comprise of 30 compulsory credits:

- Eight (8) core courses (3 credits each)
- Two (2) optional courses from 5 (3 credits each)

Programme Duration

The Master's course would be 1.5 years full-time or 2.5 years part-time.
The PG Diploma would be 1 year full-time or 2 years part-time.

Regulations and Assessment

Students should refer to the Manual of Procedures for Graduate Diplomas and Degrees**,** the regulations for Graduate Diplomas and Degrees, the Graduate Studies Guide for Students and Supervisors, and the Thesis Guide.

Assessment of Students' Performance

Examinations are held according to the UWI's regulations:

- In order to pass a course, a candidate must attend at least 75% of the lectures, tutorials and laboratory sessions; He/she must have submitted the relevant project/reports pertaining to all laboratory or industry work and must have satisfied the examiners in the associated examinations and course work.
- Examinations associated with each course shall be conducted by means of written and/or practical papers, normally taken at the end of the semester in which the candidate has registered. However, performance in course work in the form of essays, in-course tests, projects, or continuous assessments of theoretical and /or practical work, all contribute towards the final grade awarded in a course.
- All the online submissions should go through plagiarism screening through the "Turnitin" software tool. The University's policy on plagiarism would be strictly enforced for all the submitted course work.
- All the activities related to course work have their own deadline and this has to be strictly adhered to. Any delay in submission would lead to rejection of submission or proportional reduction of marks.
- When theoretical and/or practical coursework contributes towards an examination, candidates must satisfy the examiners (≥50% marks) in each component.
- Candidates who score 50% and above would be deemed to have successfully passed the course.
- In respect of any candidate who fails the coursework or written examination at the first attempt, a second attempt may be allowed upon approval from the Board of Examiners and the Campus Committee for Graduate Studies and Research.
- Candidates permitted a second attempt at a course, having failed either the coursework or the written examination at the first attempt, will be required to rewrite only that component (written examination or coursework) failed, unless the Campus Committee in any particular case decides otherwise. Marks allotted to the component passed at the first attempt will be credited to the candidate at his or her second attempt at the course. No candidate will be permitted to repeat the examination in any one course on more than one occasion, unless approval is given by the Board for Graduate Studies and Research.
- Candidates who repeat the examination in any course shall not be eligible for the award of a diploma or degree with distinction.
- A student in the master's programme who fails the Research Project may, upon approval by the Board of Examiners and the Campus Committee for Graduate Studies and Research, be granted a Diploma providing all the course requirements are met.

Grading System

Percentage	Grades
70 – 100	A
60 – 69	B+
50 – 59	B
0 - 49	F

Progress Through the Programme

- Full-time students required to complete all courses (core and optional) within one academic year (5 – 6 courses per semester). After completing all core and the required optional courses, full-time master's students would then be allowed to start the research project, which should be completed within one or two semester
- Part-time students are required to complete the courses within two academic years (2 – 3 courses per semester). After completing all core and optional courses, part-time master's students would then be allowed to start the project which should be completed within two semesters.

Time Limits for Completion and Enforced Withdrawals
Candidates would be required to withdraw from the programme if he/she fails more than six (6) credits in any one semester or fails any course or course component in a second sitting.

However, if the candidate has exhausted the maximum time limit with a deficit of no more than 6 credits for completion of the degree requirement, the Board of Examiners may recommend to the Campus Committee for Graduate Studies (after consultation with the Programme Coordinator) an extension of the period of study by one or two semesters.

Re-Admission to the Programme After Enforced Withdrawal
Candidates, who have had to withdraw from the programme because of poor academic performance, may re-apply for admission after one year of separation.

ADDITIONAL COURSE

The following four (4) credit course offered by the Department of Life Sciences is available for MPhil/ PhD students:

COURSE CODE	COURSE TITLE	CREDITS
BIOL 6062	Bioethics	4

DEPARTMENT OF MATHEMATICS AND STATISTICS

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PROGRAMMES
RESEARCH INTERESTS AND FACILITIES

The Department of Mathematics and Statistics offers MSc Degrees in Mathematics and in Statistics. The Department also offers programmes leading to the MPhil and PhD degrees. The MSc degrees are awarded on the basis of taught courses and a research project.

The MPhil and PhD are research degrees awarded on the submission and successful defense of a thesis. Each MPhil/ PhD student must also do a minimum of 8/9 credits at graduate level, as recommended by his/her Supervisor. After evaluation by his/her supervisor, MPhil and PhD candidates may be required by the Department to take substantially more credits of taught courses than the University stipulated minimum. Interested applicants should consult the Head of the Department concerning available research facilities.

Transfer from the MPhil to the PhD degree programme is possible but depends on the progress of the research undertaken and the recommendation of the supervisor and the approval of the Board for Graduate Studies and Research.

In Mathematics, the current research areas are Graph Theory and Combinatorics, Fluid Dynamics, Mathematical Modelling and Biomathematics.

MSc in Statistics

Programme Co-ordinator: Dr. Isaac Dialsingh

Objectives

To provide graduates with a comprehensive and advanced knowledge of Statistics so as to enable them to function effectively as professional Statisticians and to provide them with an adequate background for further study and research in Statistics.

Entry Requirements

To be admitted to the programme a candidate should possess a BSc degree with at least Lower Second Class Honours or its equivalent (GPA 2.5). Candidates are expected to have a minimum grade B (quality point 3.0) in the following courses or its equivalent:

COURSE CODE	TITLE
MATH 2273	Linear Algebra I
MATH 2270	Multivariate Calculus
MATH 2277	Introduction to Real Analysis I
MATH 2275	Statistics I
MATH 3465	Statistical Inference
MATH 3278	Probability Theory II

Applicants who do not satisfy these requirements may be admitted upon successful completion of qualifying courses.

Course of Study

For the MSc programme in Statistics, students are required to complete (32 credits) consisting of:

(i) 5 core courses (20 credits)
AND
(ii) 3 elective courses (12 credits) with an 8-credit Research Project (STAT 6000) which must be chosen in collaboration with at least one Lecturer in Statistics.

The course of study shall extend over one (1) year of full-time study or two (2) years of part-time study, however, at the present time, only a part-time programme is available.

Examination

Students will be required to pass both the coursework and the written examination. The pass mark is 50%. The grading scheme for graduate degrees is as follows: A 70 - 100%; B+ 60-69%; B 50-59%. In the case of the Research Project, evaluation will be based on the project report.

Award of Degree

To qualify for the award of the degree, candidates must pass all five core courses, three elective courses and the research project. The degree shall be awarded in two categories - Distinction and Pass. For the award of the degree with distinction, the candidate must have obtained an average mark of 70% or more, across all core courses and elective courses as well as 70% or more in the Research Project.

A candidate failing a course shall be ineligible for the award of distinction.

CORE COURSES: (4 CREDITS EACH)

COURSE CODE	TITLE	CREDITS
STAT 6100	Applied Probability Theory	4
STAT 6110	Applied Statistical Inference	4
STAT 6120	Linear Statistical Methods	4
STAT 6130	Sampling Theory & Techniques	4
STAT 6140	Experimental Design and Analysis	4

SELECT 3 OF THE FOLLOWING ELECTIVE COURSES

COURSE CODE	TITLE	CREDITS
STAT 6150	Stochastic Process & Applications	4
STAT 6160	Data Analysis	4
STAT 6170	Multivariate Analysis	4
STAT 6180	Advanced Topics in Statistics	4
STAT 6181	Computational Statistics I	3
STAT 6182	Computational Statistics II	3
	Other approved courses	

MSc in Mathematics

Programme Co-ordinator: Dr David Tweedle

Objectives

To impart a knowledge of Mathematics which would enable graduates to perform more effectively in the workplace and also enhance their research capability.

Entry Requirements

To be admitted to the programme, a candidate should (normally) possess a BSc degree majoring in Mathematics or equivalent (minimum GPA 2.5) with at least Lower Second Class Honours. Candidates with lower qualifications may be considered but will be required to pass qualifying courses, as prescribed by the department. All candidates must have passed the following courses (or its equivalent):

COURSE CODE	TITLE
MATH 2272	Abstract Algebra I
MATH 2273	Linear Algebra I
MATH 2270	Multivariate Analysis
MATH 2277	Introduction to Real Analysis I
MATH 2271	Ordinary Differential Equations I

Duration of Study

The course of study will extend over one year of full-time study or two years of part-time study. Part-time students will normally be required to complete the degree within two years of registration; and must complete it within three years. At present only a part-time programme is available.

Examination

Students will be required to pass both the coursework and the written examination. The pass mark is 50%. The grading scheme for graduate degrees is as follows: A 70 - 100%; B+ 60-69%; B 50-59%. In the case of the Research Project, evaluation will be based on the project report.

Award of Degree

To qualify for the award of the degree, candidates must pass all three Core courses, five/six Elective courses and the Research Project. The degree shall be awarded in two categories - Distinction and Pass. For the award of the degree with distinction, the candidate must have obtained an average mark of 70% or more, across all Core courses and Elective courses as well as 70% or more in the Research Project.

A candidate failing a course shall be ineligible for the award of distinction.

Course of Study

The MSc programme consists of 3 core courses **and** 5/6 electives:
EITHER

- 5 elective courses and an 8-credit Research Project (MATH 6000)

OR

- 6 elective courses and a 4-credit Research Project (MATH 6001)

A Research Project must be chosen in collaboration with at least one Lecturer in Mathematics. An 8-credit project is equivalent to two courses. A 4-credit project is equivalent to one course.

CORE COURSES: (4 CREDITS EACH)

COURSE CODE	TITLE	CREDITS
MATH 6100	Algebra (Group Theory and Applications)	4
MATH 6110	Real Analysis	4
MATH 6120	Differential Equation	4

ELECTIVE COURSES: (4 CREDITS EACH)

COURSE CODE	TITLE	CREDITS
MATH 6130	Algebra (Group Actions)	4
MATH 6140	Advanced Mathematical Methods	4
MATH 6150	Viscous Flows	4
MATH 6160	An Introduction to Non-Newtonian Fluid Mechanics	4
MATH 6170	Advanced Discrete Mathematics (F-Polynomials of Graphs)	4
MATH 6180	Probability	4
MATH 6190	Numerical Analysis	4
MATH 6191	Asymptotic & Perturbation Analysis	4
MATH 6192	Advanced Mathematical Modeling	4
MATH 6193	Numerical Methods for Partial Differential Equations	4
MATH 6194	Discrete Mathematics	4
MATH 6195	Finite Element Analysis	4
MATH 6310	Complex Analysis	4
MATH 6620	Topology	4
MATH 6630	Functional Analysis	4
MATH 6640	Theory of Integration	4
	Other approved courses	

RESEARCH PROJECTS

COURSE CODE	TITLE	CREDITS
MATH 6000	Research Project	8
MATH 6001	Research Project	4

DEPARTMENT OF PHYSICS

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RESEARCH PROGRAMMES

MPHIL/PHD IN PHYSICS

The Department of Physics offers MPhil and PhD research degrees on both part-time or full-time bases. MPhil/PhD students are required to complete 6/9 credits of taught masters courses. Interested applicants are required to consult with the department to ensure that research facilities are available for their research area. The Board for Graduate Studies and Research offers a limited number of scholarships to students of the highest academic standing registering for MPhil/PhD. Some departmental funding in the form of demonstratorships/teaching assistantships may be available for registered MPhil/PhD students not on scholarship.

Entry Requirements

Candidates applying for admission are required to satisfy the relevant general regulations of the Faculty and the University's Board for Graduate Studies and Research. Please consult, in the first instance, Section 1 of this postgraduate booklet.

The Department offers MPhil/PhD degrees in Physics in the areas of research being pursued by academic staff as outlined below.

RESEARCH INTERESTS

The current research in progress or research areas where activities are planned include:

(1) Electronics

- Design and implementation of Digital Signal Processing (DSP) algorithms for their application in:
  - Communication Systems
  - Automatic Speech Recognition Systems
  - Smart Grid Systems
  - Medical Devices/Systems
- Digital system design using Digital Signal Processors, FPGAs (Field Programmable Gate Arrays), Raspberry Pi, Arduino Uno etc.
- Modelling and Simulation of Communication Systems
- Smart Grid Technology
- Renewable Energy Integration with the electrical grid

(2) Medical Physics and Bioengineering

- Anthropometrics and ergonomics
- Assessment of human movement, fitness testing
- Radiation biology and medicine
- Low doses and Non-Targeted effects of ionising radiation

(3) Astronomy

- Theoretical Astronomy
  The area of focus in theoretical astronomy is with statistical analyses on the large scale structure of the Universe as well as quasars
- Observational Astronomy
  Observational astronomy offers opportunities to study variable stars and other objects such as quasars and BL lac objects. This is done with the 16' L X 200 Meade Telescope equipped with CCD camera
- Astrobiology
  Mud volcanoes and the pitch lake are studied as analog sites for Mars and Titan respectively as conditions for extremophiles

(4) Renewable Energy

This area of research may be as a joint effort with other departments, faculties, and campuses.

SOLAR ENERGY

- The design, construction and testing of low and high temperature flat plate collectors for use with solar crop dryers, solar air conditioners, refrigerators, and solar powered heat engines
- Solar Distillation
- Solar resource assessment and modelling
- Solar crop and timber dryers
- Modelling of Solar Cells
- Integration with the electrical grid

WIND ENERGY

- Wind resource assessment and modelling - onshore and offshore
- Optimising wind farm design and siting by understanding the complex physics governing wind flow
- Integration with the electrical grid

GEOTHERMAL ENERGY

- Geophysical surveys - Resistivity and Seismic
- Methods of identification of fractured reservoirs

BIOENERGY

- Production potential assessment
- GHG emissions modelling

FUEL CELL

- Modelling of Fuel Cells
- Development and Optimisation of Microbial Fuel Cell for electricity generation, wastewater treatment, oil spill remediation and water desalination

(5) Earth Materials Studies

- Various aspects of Mineralogy and Petrology of Trinidad and Tobago, including resources of the continental shelf

(6) Environmental Physics

- Environmental monitoring with respect to sound and aerosols in certain work environment
- Implications of sea surface temperatures for the Caribbean region in environmental studies
- Climate change studies/modelling – climate variability, statistical and dynamical regional downscaling
- Air pollution modelling
- Lava flow problems (in collaboration with the Department of Mathematics and Seismic Research Unit)
- Numerical weather prediction
- Atmospheric boundary layer modeling

(7) Quantum Optics

- Quantum physics with applications to solar energy technologies and medical technologies
- Parametric down conversion

(8) Condensed Matter Physics

- Light absorption in atomic systems

(9) Ceramics and Refractories

Development of ceramics and refractories based on regional materials for a wide range of applications. Current research includes:

- Chemical and mineralogical characterisation of raw materials, compositional studies, synthesis, high-temperature solid-state reactions
- Physical and mechanical testing, x-ray and electron microscopy analyses
- Micro-structure/property relationships

FACILITIES

The Department of Physics has several laboratories including the

- Astronomical Observatory
- Fuel Cell Materials Characterisation Lab
- Fuel Cell Materials Research Lab
- Material Science Lab
- Electron Microscopy Unit
- Tissue Culture Lab
- Anthropometric Lab
- Smart Grid Research Lab
- Digital System Design Lab
- Environmental Physics Lab
- Solar Lab
- Electronics Workshop
- XRD Unit
- Mechanical and Woodwork Workshop
- Introductory Physics Lab
- Ceramics Lab
- Optics Lab
- Geothermal Energy Lab
- Medical Physics Lab

MPHIL/PHD IN RENEWABLE ENERGY TECHNOLOGY

The MPhil and Ph.D. programmes in Renewable Energy Technology were conceived because of the urgent necessity of the UWI and the Caribbean region to invest in renewable energy technology. The Caribbean region has abundant renewable energy resources that have yet to be harnessed with the appropriate renewable energy technologies. These programmes are to build human capacity in the Caribbean region in renewable energy technologies to meet the challenges of escalating price and availability of fossil fuels and support the protection of the environment. The emphasis in these programmes is on providing new graduates and persons already working in various sectors of the energy with the requisite training and educational opportunity to modify, enhance, and develop technologies and approaches through research in renewable energy. These graduate research programmes will provide the required research expertise, advanced skills, necessary infrastructure and knowledge-base which would serve to ultimately build capacity for renewable energy technology-based industries, businesses and services in the Caribbean region and beyond. It would create avenues for advanced research and the development of intellectual capacity for the promotion of industrial, business and entrepreneurial activities in this renewable energy field and is in alignment with the UWI's Triple A Strategy.

The aim of the MPhil/Ph.D. programme in Renewable Energy Technology is to equip individuals with research, problem solving, and communication skills to provide solutions to research gaps in renewable energy technologies and their sustainable development. The potential users of this programme would be natural and applied scientists, engineers, entrepreneurs, students, and teachers. This is a new programme that is designed to foster research in both basic and applied fields of renewable energy which would ultimately contribute to the higher learning, capacity building and career advancement of its enrolled users.

It is expected that entrants to the course will be from the following sectors:

- Recent graduates of Natural Sciences (both physical and life sciences) and Engineering seeking to conduct research in the renewable energy technology field towards an MPhil or Ph.D.;
- Post graduates of Natural Sciences, Engineering and Renewable Energy Technology seeking to conduct research in the renewable energy technology field towards an MPhil or Ph.D.;
- Personnel with the required technical and educational experience who aspire to conduct research in the renewable energy field thus obtaining an MPhil or Ph.D. in Renewable Energy Technology.

The growing demand and need for qualified renewable energy technologists in Trinidad & Tobago and the Caribbean region could be fulfilled by outfitting interested persons, who meet the entrance requirements, with the necessary tools and research experience.

QUALIFICATIONS FOR ADMISSION

The following are eligible to apply for registration in *MPhil in Renewable Energy Technology*:
Holders of a First degree from a recognized University in the Natural Sciences, Engineering and Technology or any other related discipline.

The minimum requirement for admission to an MPhil is a minimum GPA of 3.0, or an Upper Second Class Honours degree or its equivalent, unless the Campus Committee in any particular case otherwise decides.

The following are eligible to apply for registration in the *Ph.D. in Renewable Energy Technology*:
Approved graduate degree awarded primarily for research (MPhil) or taught Masters degree from the UWI or another approved University, provided that the taught Masters programme included a research component of at least 20% of the total credit rating of the programme and the applicant achieved at least a B+ average or its equivalent;

Admission is contingent on whether candidates have a thesis proposal compatible with the expertise and resources available.

The Department shall consider each applicant's overall academic strengths, accomplishments, research background, publications (if any), and experience for admission into the programme. As such, applicants may be interviewed.

COURSE OF STUDY

The programme duration and the credit requirements are set by the Board of Graduate Studies. Please refer to the university's postgraduate regulations and booklet for further details.

PROGRAMME DURATION

	MPhil	**PhD**
Full time	2-3 years	3-5 years
Part time	2-5 years	3-7 years

TAUGHT COURSES CREDITS*

- 6-9 credits in taught courses for the MPhil
- 9-12 credits in taught courses for the PhD

*Additional credits may be required based on the candidate's prior knowledge, exposure to the field, learning and skills requirements for the intended research topic.

Courses:

All students will be required to pursue either COMP 6501- Research Methods, Entrepreneurship and Intellectual Property or AGBU 6301 – Research Methodology.

Students may be prescribed courses from the MSc Renewable Energy Technology programme (refer to our taught programmes in the subsequent sections) or other related fields. If students graduated from the MSc in Renewable Energy Technology, suitable courses from other programmes will be identified.

Based on the research needs and skill requirement, the supervisors can also prescribe courses available from other Programmes, Departments, Faculties and also from outside of the University.

Students will also be encouraged to pursue ETHI 6000 – Research Ethics (online).

RESEARCH SEMINARS

Students enrolled for an MPhil degree must satisfactorily complete at least two research seminars, to be convened by the relevant Head of Department, prior to the submission of their MPhil thesis. Students enrolled for a PhD degree must satisfactorily complete three such seminars. The upgrade seminar will count as one of the three seminars for the PhD, provided that it is not the last seminar. Assessment of students' seminars must be included in their Progress Reports.

THESIS

Candidates are required to present and defend a thesis of acceptable scope and quality for the degree. The Thesis must follow the guidelines set out in the University's Thesis Guide.

RESEARCH PROGRESS

Students are expected to refine their research proposal in the first semester of their programme and present their first seminar on the proposal within the first year of the programme.

Collaborations with various faculties, campuses, and international institutions as is required for the student's progress would be pursued.

Students and their supervisors will be encouraged to apply for funding in the first two years of the programme. This activity is contingent on the completion of ETHI 6000 Research Ethics.

It is recommended that PhD students pursue at least one research fellowship at an international laboratory and institution for at least three months. Students and supervisors will be required to explore this option after the first year of the programme and on the completion of (i) a full research proposal and (ii) the ETHI 6000 Research Ethics course. Most international laboratories often require a full proposal as well as the component of the proposal that is to be done at the lab.

UPGRADE FROM MPhil TO PhD

A candidate registered for the MPhil degree may apply for the upgrade of his or her registration to the PhD after a period of one year full-time, or two years part-time from the date of initial registration. The candidate must have the support of the supervisor and the Head of Department and have given evidence of the qualifications necessary for writing a thesis for the PhD. The Upgrade will be facilitated according to the *Regulations For Graduate Certificates, Diplomas and Degrees* and the *Guidelines for Upgrading MPhil to PhD.*

REGULATIONS AND ASSESSMENT

The Regulations and Assessment procedures for the MPhil/PhD in Renewable Energy Technology conform to those provided in the UWI Regulations for Graduate Diplomas and Degrees. Students will be assessed by independent examiners as according to the UWI's graduate regulations. Final assessment will be by way of the submission of a thesis in accordance with the specifications laid down in the Faculty's regulations, after having been certified by the Supervisor that the thesis is ready for submission.

CONFERRAL OF THE DEGREE

The successful completion and assessment of the compulsory coursework, Seminar Presentation and the Thesis will lead to the award of the degree.

COMMENDATION

The award of an MPhil/PhD shall be conferred with high commendation where the Examiners are unanimous in their recommendation that such an award should be made in accordance with the Regulations of the Board of Graduate Studies.

TAUGHT PROGRAMMES

MSC IN RENEWABLE ENERGY TECHNOLOGY (RENT)

The emphasis in this master's programme is on providing new graduates and persons already working in various sectors of the economy, with professional training and education in renewable energy technologies. The programme will provide expertise in these areas to help build capacity in renewable energy and open possibilities for further study and research.

Aims and Objectives

This programme is intended to meet the needs of a broad range of professionals whose occupations are related to science and energy, and sustainable development. Included will be natural scientists, engineers and technical-related professionals, as well as those from the social sciences such as administrators.

Admissions Criteria

BSc Science degree

Students normally would be required to have a Lower Second Class Honours degree from a recognised university in Science or Engineering. Students may be required to undergo the Preliminary Study. Students must complete and pass this not-for-credit preparatory course.

For further information, contact the department.

Duration

Students enrolled in MSc Renewable Energy Technology programme are expected to complete the programme in 15 months (full-time) and 27 months (part-time).

Course of Study

All students must take 8 compulsory courses worth 24 credits, 4 elective courses worth 12 credits, and a 9-credit Final Research Project – for a total of 45 credits.

Programme Content

The courses for the programme are listed below, with the eight (8) compulsory courses. Students will also be required to complete four (4) courses from the list of six (6) Elective courses, as well as the 9-credit Research Project course. The Core and Elective courses, together with the Research Project, total 45 credits.

Modes of Delivery

A variety of delivery methods will be employed, which include face-to-face sessions, virtual seminars, tutorials, and field visits. In addition to timetabled lectures and laboratory sessions during weekday evenings, sessions may also be conducted on weekends and holidays in order to synchronise with lecturer availability. The delivery methods may be supported by distance learning and e-based course assignments as well as case studies and assignments in which group work and student centred learning approaches are fostered. The programme will be delivered by international, regional and local lecturers.

COURSE LISTING

CORE COMPULSORY (8 COURSES – 24 CREDITS)

SEMESTER I

COURSE CODE	COURSE TITLE	CREDITS
PHYS 6295	Solar Energy Conversion	3
PSMA 6106/ PRMG 6003	Programme and Project Management	3
RENT 6001	Energy Economics	3
RENT 6002	Shaping Sustainable Energy Systems	3
RENT 6005	Wind Energy I	3
RENT 6006	Bioenergy I	3

SEMESTER II

COURSE CODE	COURSE TITLE	CREDITS
RENT 6007	Energy Use and Energy Auditing	3
RENT 6008	Electrical Integration of Renewables	3

ELECTIVES (4 COURSES – 12 CREDITS)

Electives will be run on the basis that there are minimum of ten (10) students registered for the course.

SEMESTER II

COURSE CODE	COURSE TITLE	CREDITS
RENT 6009	Hydro and Marine Power	3
RENT 6010	Geothermal Energy	3
RENT 6011	Energy Storage (not offered in 2021/2022)	3
RENT 6012	Advanced Solar Energy	3
RENT 6013	Wind Energy II	3
RENT 6014	Bioenergy II (not offered in 2021/2022)	3

RESEARCH PROJECT

COURSE CODE	COURSE TITLE	CREDITS
RENT 6000	Research Project (Research work + Oral Presentation and Report)	9

COURSE LISTING AND PROGRESSION

FULL-TIME STUDY

The tentative schedule of courses for full-time study is listed under the Programme Content section.

PART-TIME STUDY

The suggested course of study for part-time students is:

YEAR I, SEMESTER I

COURSE CODE	COURSE TITLE	CREDITS
RENT 6005	Wind Energy I	3
RENT 6006	Bioenergy I	3
PHYS 6295	Solar Energy Conversion	3

YEAR I, SEMESTER II

COURSE CODE	COURSE TITLE	CREDITS
RENT 6007	Energy Use and Energy Auditing	3
RENT 6008	Electrical Integration of Renewables	3
*1 Elective		3

YEAR II, SEMESTER I

COURSE CODE	COURSE TITLE	CREDITS
RENT 6001	Energy Economics	3
PSMA 6106/ PRMG 6003	Programme and Project Management	3
RENT 6002	Shaping Sustainable Energy Systems	3

YEAR II, SEMESTER II

COURSE CODE	COURSE TITLE	CREDITS
*3 Electives		9

YEAR III, SEMESTER I
RESEARCH PROJECT

COURSE CODE	COURSE TITLE	CREDITS
RENT 6000	Research Project Research work + Oral Presentation and Report	9
TOTAL		**45**

***NB: Electives will be run on the basis that there are minimum of ten (10) students registered for the course.**

MSC IN BIOMEDICAL PHYSICS (BIPH)- PART-TIME ONLY

(with specialisation in Medical Physics)

Biomedical Physics is an applied branch of Physics concerned with the application of concepts and methods in Physics to the solution of problems in Biology and Medicine. This master's degree is a unique interdisciplinary programme which was developed to produce graduates with a knowledge of radiation physics applied to medicine, modern technology involved in diagnostic processes and the interaction of radiation with human tissue. It is an excellent opportunity for students to enhance their education in Physics, Biology, Electronics and Bioengineering while developing their analytical and problem-solving skills. The wide spectrum of knowledge required of the Biomedical Physicist makes this profession both challenging and rewarding as they improve their understanding of the study of the human body and attempt to solve current medical problems.

Aims and Objectives

This programme is intended to specially train, and augment the education of scientists and engineers so as to ensure that (i) graduating students have sufficient competence in the field of Biomedical Physics in order to start a career or continue in research and development, and (ii) the requirements of international professional societies are incorporated to a sufficient level so as to prepare graduates interested in obtaining certification.

Entry Requirements

Admission requirements for this programme are as follows:

- First degree from a recognised University in Biomedical Technology, Physics, Applied Physics, Biomedical/ Mechanical/Electrical Engineering with a minimum of Lower Second Class Honours (weighted GPA: 2.50 – 2.99).
- Persons without adequate coverage of these areas may be required to pursue and pass (at least 50% final marks) appropriate qualifying courses before admission into the MSc programme;
- Candidates not meeting the grade or GPA requirements but who have sufficient work experience in a relevant area may also be admitted. They may be further required to complete minimum pre-requisite courses based on their needs as directed by the Programme Coordinator or Department Head.

Course of Study

The programme consists of a common core and specialization in Medical Physics. Students are required to complete 18 credits of core courses, 21 credits of elective courses, and a research project of 8 credits as outlined below. This results in a total of 47 programme credits.

Each theoretical 3-credit course consists of 24 hours of lectures and 12 hours of tutorials. Field trips and/or laboratory work are allocated to the laboratory courses which are also weighted as 3 credits.

The programme is run part-time and involves five (5) semesters of coursework and examinations followed by the research project performed over a period of two (2) semesters. This will give a total of 7 semesters.

Duration

Students enrolled in the MSc programme usually complete their degree in 7 semesters.

Modes of Delivery

A variety of delivery methods will be employed, which include face-to-face sessions, virtual seminars, tutorials, and field visits. In addition to timetabled lectures and laboratory sessions, lectures may also be conducted on weekends and holidays in order to synchronise with lecturer availability. The delivery methods may be supported by distance learning and e-based course assignments as well as case studies and assignments in which group work and student-centered learning approaches are used. The programme will be delivered by international, regional and local lecturers.

Programme Content

The list below shows the programme's six [6] core course, seven [7] elective courses as well as the 8-credit Research Project. The core and elective courses, together with the Research Project give a total of 47 credits.

CORE MODULES
(18 credits)
Physics

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6100	Physics of the Human Body	3
BIPH 6101	Human Anatomy & Physiology	3
BIPH 6102	Numerical Methods for Biomedical Applications	3
BIPH 6103	Workplace Safety and Protection	3
MDPH 6150	Biomedical Statistics and Informatics	2
COMP 6501	Research Methods, Entrepreneurship and Intellectual Property	3
OESH 6300	Seminar	1

ELECTIVES
Area of Specialisation **– Medical Physics (21 CREDITS)**

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6104	Radiation Physics & Dosimetry (not offered in 2021/2022)	3
BIPH 6105	Radiation Biology	3
BIPH 6106	Radiation Oncology	3
BIPH 6107	Biomedical Imaging	3
BIPH 6108	Nuclear and Atomic Physics	3
BIPH 6109	Medical Physics Laboratory I	3
BIPH 6110	Medical Physics Laboratory II	3

RESEARCH PROJECT

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6118	Research Project	8

List of courses offered for the MSc in Biomedical Physics for the academic year 2021/2022:

Semester 1

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6100	Physics of the Human Body	3
BIPH 6101	Human Anatomy and Physiology	3
BIPH 6103	Workplace Safety and Protection	3
BIPH 6108	Nuclear and Atomic Physics	3
COMP 6501	Research Methods, Entrepreneurship and Intellectual Property	3
MDPH 6150	Biomedical Statistics and Informatics	2
BIPH 6118	Research Project	8

Semester 2

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6104	Radiation Physics & Dosimetry (not offered 2021/2022)	3
BIPH 6105	Radiation Biology	3
BIPH 6106	Radiation Oncology	3
BIPH 6107	Biomedical Imaging	3
BIPH 6109	Medical Physics Laboratory I	3
BIPH 6110	Medical Physics Laboratory II	3
BIPH 6118	Research Project	8
OESH 6300	Seminar	1

Semester 3 (Summer)

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6102	Numerical Methods for Biomedical Applications	3

COURSE LISTING AND PROGRESSION
The curriculum for the Master's programme consists of core courses supplemented by elective courses that provide greater depth in a specific area of medical physics. Assessments will consist of in-course assessments, laboratories, written comprehensive exams and a Master's thesis.

YEAR 1 - SEMESTER I

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6100	Physics of the Human Body	3
BIPH 6101	Human Anatomy & Physiology	3
BIPH 6108	Nuclear and Atomic Physics	3

YEAR 1 - SEMESTER II

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6104	Radiation Physics & Dosimetry (not offered 2021/2022)	3
BIPH 6105	Radiation Biology	3
BIPH 6106	Radiation Oncology	3

YEAR 1 - SUMMER

COURSE CODE	COURSE TITLE	CREDITS
BIPH 6102	Numerical Methods for Biomedical Applications	3

YEAR 2 - SEMESTER I

Course Code	Course Title	Credits
BIPH 6103	Workplace Safety and Protection	3
MDPH 6150	Biomedical Statistics and Informatics	2
COMP 6501	Research Methods, Entrepreneurship and Intellectual Property	3

YEAR 2 - SEMESTER II

Course Code	Course Title	Credits
BIPH 6104	Radiation Physics & Dosimetry (not offered 2021/2022)	3
BIPH 6107	Biomedical Imaging	3
BIPH 6109	Medical Physics Laboratory I	3
BIPH 6110	Medical Physics Laboratory II	3
OESH 6300	Seminar	1

YEAR 3 - SEMESTER I

Course Code	Course Title	Credits
BIPH 6118	Research Project	8

YEAR 3 - SEMESTER II

Course Code	Course Title	Credits
BIPH 6118	Research Project	8

COURSE DESCRIPTIONS

MSc Programmes

- Biodiversity, Conservation and Sustainable Development in the Caribbean (both Diploma and MSc)
- Biotechnology (both Diploma and MSc)
- Biomedical Physics
- Computer Science and Technology with Specialisations in Mobile Computing and Cloud Technologies
- Data Science
- Mathematics
- Occupational and Environmental Safety and Health
- Renewable Energy Technology
- Statistics

Biodiversity Conservation & Sustainable Development in the Caribbean (Diploma & MSc)

SEMESTER: 1
COURSE CODE: BIOL 5200/BIOL 6200
COURSE TITLE: CHARACTERISTICS OF BIODIVERSITY
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will form part of the background information to the programme. It will include basic concepts of biodiversity from the molecular- to the ecosystem-scale. This will be placed in the context of the extinction crisis and international treaties such as the Convention on Biological Diversity that have been formulated to address this crisis. It will, in particular, highlight the importance of biodiversity in terms of ecosystem function, goods and services. The course will define biodiversity in terms of species richness and diversity indices and explore the cline in diversity across different latitudes. Within this concepts such as endemicity and keystone species will also be described. The molecular genetic component of the course will cover the concepts of molecular genetics, intra-specific variation, inter and intra-specific genetic diversity, processes of evolution and speciation. The course will then go on to describe the regional ecosystems including forest, savannah, riverine, wetland, mangrove and coastal-marine systems including coral reefs. Impacted ecosystems such as urban and agricultural landscapes will also be treated. In each case, these systems will be considered holistically in relation to their diversity, distribution, ecology and ecosystem function, including the goods and services they provide.
ASSESSMENT:
Coursework: 100%

SEMESTER: 2
COURSE CODE: BIOL 5201/BIOL 6201
COURSE TITLE: THREATS TO TROPICAL BIODIVERSITY
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will examine the major threats to tropical biodiversity and ecosystems. It will highlight the major threats, as described in the CBD: habitat loss and degradation, over-exploitation, climate change, pollution and introduction of alien species. It will also examine the history of human intervention in tropical environments. In specific relation to loss of genetic diversity, issues including threats to genetic diversity, loss of populations, reductions in heterozygosity and their consequences, inbreeding depression and genetic bottlenecks will be considered. Using examples, and case studies, major threats will be considered in relation to the impacts being seen on some of the ecosystems described in BIOL6100. It will include a description of human altered terrestrial and coastal environments. Consideration will also be given to the issues of environmental stress including impacts of pollution and climate change on terrestrial and marine systems. Evidence for global warming, impacts on species and ecosystems and methods for the detection of climate change will be described.
ASSESSMENT:
Coursework: 100%

SEMESTER: 1
COURSE CODE: BIOL 5202/BIOL 6202
COURSE TITLE: ENVIRONMENTAL LAW AND MULTILATERAL ENVIRONMENTAL AGREEMENTS
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will provide students with a background to the sources for existing environmental laws, and of the specific framework for regulation of the environment in the Caribbean region. It will examine the ways in which human behaviour with respect to the environment is regulated at the international level, with specific reference to key biodiversity-related MEAs. This will involve a brief review of the legal and institutional framework within which international law making on the environment takes place. The course will provide students with a basic understanding of the existing legal environmental regimes of selected Caribbean countries.
The course will then articulate this regional framework within its international context. The course will introduce students to some of the factors that surround and influence the negotiation and implementation of international environmental law. Key MEAs, including the Convention on Biological Diversity, the Biosafety Protocol, the UN Convention on Climate Change, Cartagena Convention, RAMSAR, CITES and Principle on Forests will be used as examples to illustrate the key issues. Students will also be introduced to key regional environmental agreements, including the Cartagena Convention, SPAW Protocol. Additionally, students will be introduced to key issues specific to biodiversity conservation including bio-piracy, liability and redress, access and benefits sharing, and existing legal models for management of cross-border resources including migratory species and cross-jurisdictional protected natural areas.
ASSESSMENT:
Coursework: 100%

SEMESTER: 3 (SUMMER)
COURSE CODE: BIOL 5203/BIOL 6203
COURSE TITLE: ENVIRONMENTAL ECONOMICS
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: The course will begin by introducing basic economic principles and exploring the limits of human nature in dealing with environmental degradation. It will then consider environmental economics from several perspectives, examine various economic tools and discuss their limitations. Using examples, it will then apply these tools to everyday scenarios that illustrate the possibilities and limitations of economics in resolving environmental and natural resource issues.
ASSESSMENT:
Coursework: 100%

SEMESTER: 2
COURSE CODE: BIOL 5204/BIOL 6204
COURSE TITLE: ENVIRONMENTAL IMPACT ASSESSMENT:
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: The course provides a general overview of the variety of environmental assessment tools currently available and an introduction to Environmental Impact Assessment (EIA) including definition, goals, objectives and purpose of EIA, definition of key terms, history of Environmental Impact Assessment and the legislative, policy and institutional framework for EIA. It will describe the EIA process, with emphasis on biodiversity conservation and sustainable use; the development of the Terms of Reference (TOR) including screening, scoping and public participation; and the assessment of project impacts, including understanding the ecosystem, assessment of significant impacts of the project and impact management. It will then consider reporting Environmental Impact Statement (EIS) and Environmental Management Plans, review of the EIS, linked to the TOR; and follow up monitoring, auditing, adaptive management and enforcement. Special consideration will be given to public participation, EIA standards, EIA for island, and Strategic Environmental Assessments.
ASSESSMENT:
Coursework: 100%

SEMESTER: 1
COURSE CODE: BIOL 5205/BIOL 6205
COURSE TITLE: PRINCIPLES & PRACTICE OF GEOINFORMATICS
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will provide an overview of the principles of geoinformatics including an introduction to geographic information systems, Global Positioning Systems and field survey techniques. Following an introduction to geoinformatics and definitions, the course will cover spatial data acquisition using GPS and field survey techniques, GIS data structures and capabilities. It will describe GIS and network analysis and spatial data analysis, and GIS functionality. Finally it will consider hardware and software systems and the design and implementation of GIS.
ASSESSMENT:
Coursework: 100%

SEMESTER: 2
COURSE CODE: BIOL 5206/BIOL 6206
COURSE TITLE: MANAGEMENT & ANALYSIS OF ENVIRONMENTAL DATA
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will provide practical training in data management and statistical analysis of environmental data. Students will attend an initial series of lectures on univariate and bivariate numerical techniques. These lectures will cover experimental design of ecological studies and the application of basic parametric and non-parametric statistics to simple environmental datasets. We will then focus on how one can determine an effective sample size for their study, species richness and abundance indices, data exploration techniques prior to analysis, and then progress to explore the use of multivariate statistical techniques to analyse environmental datasets first looking at multiple regression and generalised linear modeling, and then focusing on interdependence techniques (both indirect and direct gradient analyses). The course will then look at database management for environmental data, followed by social instrument design, implementation, and analysis. All statistical work will be done using programme R.
ASSESSMENT:
Coursework: 100%

SEMESTER: 1
COURSE CODE: BIOL 5207/BIOL 6207
COURSE TITLE: SUSTAINABLE USE & DEVELOPMENT OF NATURAL RESOURCES
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course will address important tropical ecosystem based industries including forestry, wildlife, agriculture, fisheries, energy, the pharmaceutical industry and tourism. In order to be sustainable, these industries will have to adopt environmental activities as core to their business, rather than consider them as an externality. Topics covered in this course will include an analysis and determination of land capability and optimal land use. Social aspects of land use and land degradation, and participatory approaches in sustainable development, will be discussed. The need for the integration of soil and water conservation in farming systems, and integration of water needs in agriculture with industrial and potable supply requirements. Agro-ecosystems will be considered in relation to sustainable mono-cropping, multiple cropping and agro-forestry systems for tropical environments. Sustainable forestry and timber production will also be examined. Participants to the course will also be exposed to development and exploitation of biodiversity for renewable energy (bio-fuels) and carbon sequestration in the context of REDD+ and related discussions in the Climate Change arena. Finally, current issues of fishery management will be examined as countries try to achieve sustainability in tropical capture fisheries, including management of freshwater environments for fisheries production, the integration of aquaculture production systems into agricultural and water conservation practices.
ASSESSMENT:
Coursework: 100%

SEMESTER: 2
COURSE CODE: BIOL 5208/BIOL 6208
COURSE TITLE: CONSERVATION & MANAGEMENT OF BIODIVERSITY
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: The course will include development of priorities for species conservation, conservation of genes and genetic diversity, selection and design of protected areas, the application of island biogeography theory and SLOSS, population dynamics and population viability analysis to protected area design. Students will gain an understanding of the principles of protected area selection site management. The use of zoning schemes, particularly in relation to coastal zone management schemes will also be covered. The use of management plans will be discussed together with the assessment of management effectiveness. The course will also examine ex-situ conservation programmes and re-introductions of species as well as aspects of habitat restoration. The important role and participation of the public will also be considered with regard to the selection, design and management of protected areas as well as through the potential benefits of tourism and ecotourism.
ASSESSMENT:
Coursework 100%

SEMESTER: 1
COURSE CODE: BIOL 5209/BIOL 6209
COURSE TITLE: POLLUTION & ECOTOXIOCOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course is designed to give students an understanding of the basic principles of pollution monitoring and ecotoxicology and how toxicants are distributed, taken up, assimilated and impact the environment. The course will also distinguish between structural and functional endpoints and how these can highlight the potential impacts of industry on the natural environment. The course will also look are particular pollutants that are of concern to Trinidad, such as: pesticides, industrial effluents and heavy metals. Students will also be able to understand how environmental monitoring tools such as toxicology, environmental chemistry and ecology can be used together to understand the relationship between industry and ecology by using these tools to conduct Ecological Risk Assessments.
ASSESSMENT:
Coursework 100%

SEMESTERS: 3 (SUMMER)
COURSE CODE: BIOL 5210/BIOL 6210
COURSE TITLE: FIELD PRACTICUM (TOBAGO OR SURINAME – DEPENDING ON NUMBERS)
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course comprises the main practical portion of the programme. It will provide students with the opportunity to apply and test their understanding of concepts covered in the taught courses of the programme, as well as allow them to develop their practical skills techniques, provide a face to face setting for interaction with faculty and with other distance learners on the programme. The course will go over the appropriate collection and survey techniques for various biological taxonomic groups. Status surveys and other population ecological work will be covered. Socio-economic survey work will also be undertaken in the field. (Students are expected to fund their flight to and from the field practicum.)
ASSESSMENT:
Coursework: 100%

SEMESTERS: 3 (SUMMER)
COURSE CODE: BIOL 5210/BIOL 6210
COURSE TITLE: FIELD PRACTICUM (BELIZE)
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course comprises the main practical portion of the programme. It will provide students with the opportunity to apply and test their understanding of concepts covered in the taught courses of the programme, as well as allow them to develop their practical skills techniques, provide a face to face setting for interaction with faculty and with other distance learners on the programme. The course will go over the appropriate collection and survey techniques for various biological taxonomic groups. Status surveys and other population ecological work will be covered. Socio-economic survey work will also be undertaken in the field. (Students are expected to fund their flight to and from the field practicum).
ASSESSMENT:
Coursework: 100%

SEMESTER: 3 - 1
COURSE CODE: BIOL 6211
COURSE TITLE: RESEARCH PROJECT
NUMBER OF CREDITS: 12
PREREQUISITE: NONE
COURSE DESCRIPTION: The Research Project is a fundamental component of the MSc programme and this is reflected, not only in the credit weighting, but by the fact that the MSc runs for an extra 6 months so that the student may have the necessary time to complete the project to a high standard. Students will come to the Course Leader and/or University Focal Point during the first semester of the MSc with potential ideas for their research project. A list of potential projects will be also be made available for those students who do not have a specific topic in mind. During the first two semesters, the student and Course Leader and/or University focal point will meet either face-to face or through a virtual platform (as determined by the Course Leader), at least twice, to further develop the research project idea, develop clear aims and objectives, and identify appropriate second supervisors. The research project may cover any feasible aspect of environmental management of tropical biodiversity. It may involve a pure research study toward a fundamental aspect of tropical biodiversity or address more applied issues in biodiversity conservation. It may involve field or laboratory-based work or may be a desk study involving data analysis or interrogation of legal documents. It may support studies being undertaken by staff within UWI or the partner Universities of the MSc Programme, or it may address an issue related to a student's employer. For students from outside of Trinidad, the project may be undertaken within Trinidad or in the student's home country. The project should, however, give the student a chance to further develop technical skills learnt during the field practicum and a more detailed understanding of some theoretical component of the course.
ASSESSMENT:

Coursework:	100%

SEMESTER: 3 (SUMMER)
COURSE CODE: BIOL 5212/6212
COURSE TITLE: TAXONOMY AND BIODIVERSITY INFORMATICS
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course is a core course in the programme, providing an understanding of the description and classification of organisms which is fundamental for biodiversity conservation. It provides an overview of the status of taxonomy and various classification systems, as well as a summary of the speciation process, biogeography and the field of molecular systematics. Species are identified as the building block for taxonomic classification and species concepts are discussed in detail. During the course, students will learn of the role of natural history museums and herbaria together with their collections in conservation. Collection and preservation methods for various taxa are presented and their curation is discussed. Identification methods and tools, including taxonomic keys, are presented and used as part of the course. The course includes a bioinformatics component that focuses on the use of online databases, as well as those found at local institutions. These include biodiversity databases, molecular databases and natural history collection databases. By the end of the course, students learn to use various databases to derive biodiversity information. The use of database management software is also emphasised as a tool for the creation of new biodiversity databases.
ASSESSMENT:

Coursework:	100%

SEMESTER: 2
COURSE CODE: BIOL 5214/6214
COURSE TITLE: ENVIRONMENTAL RESOURCES POLICY
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This policy course provides an overview of the basic foundations for environmental resource policy, its evolution and the linkages with a wide scope of socio-economic and socio-ecological issues. It affords students the opportunity to understand the various concepts of environmentally and ecologically sustainable development processes emerging from social consciousness of environmental impacts on natural resources and their management. It provides a learning process for understanding the basic principles involved in setting environmental resource goals and articulating a vision for various environmental resource policies. Key natural resource issues are reviewed from the perspective of developing policy making processes using best practices. It provides students with a level of understanding of the relevant issues and techniques for scoping and developing environmental resource policies. Students are afforded the opportunity to prepare policy briefs for specific environmental and natural resource issues including a step-by-step policy making exercises and simulations of practical problems and issues involved in the policy making process. Overviews of carefully selected international environmental instruments and their nexus with natural resource management and environmental drivers facilitate an understanding of the globalisation of environmental policy making. It provides opportunities for students to have basic understanding and appreciation for environmental resource governance models and how these impact policy.
ASSESSMENT:
Coursework: 100%

SEMESTER: 2
COURSE CODE: BIOL 5215/6215
COURSE TITLE: SOCIO-ECOLOGY AND NATURAL RESOURCES MANAGEMENT
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: Successful natural resources management requires the development of consensus of all stakeholders on the goals of such management and the activities to be undertaken to achieve such goals. The need for such a consensual approach is especially important in biodiversity management situations where indigenous, tribal and rural communities have traditionally used or hold rights to access and utilisation of such resources. To enable the students to understand the context for these types of challenging resource management scenarios, the course begins by introducing current sociological thinking on the nature of, and relationships between, human values, beliefs, and attitudes to nature. It then reviews western scientific approaches to renewable resources management in the context of traditional economically driven resource production. The students will then review through case studies regional examples of natural resources use by rural, tribal indigenous peoples and compare and contrast the basis for these interactions with western, science-based natural resources management. Finally, the students will be introduced to the basic tools currently used by natural resource managers to assess impacts on management interventions on rural and indigenous peoples, and tools for integrating these communities in resource management decision making.
ASSESSMENT:
Coursework: 100%

Master of Science (MSc) Biotechnology and Post Graduate Diploma in Biotechnology

SEMESTER: 1
COURSE CODE: BIOT 6000/5000
COURSE TITLE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: Recombinant DNA technology is fundamental to molecular biotechnology and encompasses many scientific disciplines including molecular biology, microbiology, biochemistry, immunology, genetics, chemical engineering and cell biology. RDNA technology also generates a wide range of consumer products including crops, livestock, drugs, vaccines and diagnostic tools, and livestock. Topics covered under this course are, Gene Regulation, Recombinant DNA Technology, Gene synthesis, Sequencing, and Amplification of DNA, Manipulation of Gene Expression in Prokaryotes, Heterologous Protein Production in Eukaryotic cells, Directed Mutagenesis and Protein Engineering, Molecular Diagnostics, Therapeutic Agents, Large-Scale Production of Proteins from Recombinant Microorganisms, Transgenic Animals, Regulating use of Biotechnology. This course is a techniques-based course that seeks to provide students with the required knowledge which serves as a basis for experimental, applied and industrial biotechnology. The student, upon completion of this course, should acquire a comprehensive understanding and practical expertise in basic molecular biology and biotechnology techniques. This foundation is important for the understanding and practical experimentation of several more advanced techniques and their applications in many biology-related fields. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work and a final examination (50% for each component).

CONTACT HOURS:
Lecture/tutorial: 2 hours per week
Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**50%**
• Lab report:	10%
• Term paper & journal paper discussion:	20%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**50%**

SEMESTER: 1
COURSE CODE: BIOT 6001/5001
COURSE TITLE: MICROBIAL AND ENVIRONMENTAL BIOTECHNOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: This course examines current applications of microbial organisms for industrial and environmental applications. It also illustrates specific applications of biotechnology to solve environment related problems. The course provides a theoretical and working knowledge of the principles, techniques and current applications of microbial organisms for manufacturing components of food and consumer products, biologics and biomaterials using recombinant DNA and is organised following the steps in discovery and development of biologics. An introduction to microbial growth kinetics is included as well as discussions on generating products from genetically modified microorganisms. The second part of the course will introduce the applications of biotechnology to address important environmental issues. Applications: application of biotechnology to environmental quality evaluation, monitoring, remediation of contaminated environments and energy production, production of biofuels (biogas, bioethanol, biohydrogen), applications in the paper and plastic industry as well as in other industrial processes in order to promote processes minimising environmental deterioration. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work and a final examination (50% for each component).

Upon successful completion of this course, students must be able to:
- illustrate the development of recombinant microorganisms for specific applications in science and industry.
- investigate the applications of recombinant and native microorganisms for synthesis and extraction of novel proteins and chemical compounds.
- evaluate the choice of techniques for experiments in Biotechnology.
- explain, illustrate and interpret the principles, mechanisms of bioremediation.
- evaluate the applicability of various tools in environmental biotechnology, their applicability and related developed technologies.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**50%**
• Lab report:	10%
• Term paper & journal paper discussion:	20%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**50%**

SEMESTER: 2
COURSE CODE: BIOT 6002/5002
COURSE TITLE: ADVANCES IN PLANT GENETIC ENGINEERING AND PLANT BIOTECHNOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY
COURSE DESCRIPTION: This course emphasises the advancements that have taken place in plant transformation technologies and genetic engineering methodologies for introduction of beneficial traits into economically important plants. The topics include an advanced study of Plant cell and tissue culture; Molecular basis of plant organ differentiation; Micropropagation for virus elimination, Anther and microspore culture, dihaploid plants, in vitro fertilisation, Embryo rescue and wide hybridisation, Protoplast culture and fusion, Somaclonal variation- in vitro mutagenesis, in vitro germplasm, conservation; Production of secondary metabolites; Plant genetic transformation methods (direct and indirect); Molecular basis of transgenesis; Expression systems in plants; Transgene design-Promoters & Marker genes; Transcription factors in transgene expression; Molecular Markers; Analysis of transgenic plants; Plant genetic engineering for herbicide tolerance, Disease and pest resistance, Abiotic stress tolerance, Improving nutritional quality and yield; Biopharming; Plant based production of biofuels, bioplastics, industrial and therapeutic proteins. Limitations and environmental concerns and Marker free transgenic plants, avoidance of horizontal gene transfer; recent developments in plant genetic engineering. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work and a final examination (50% for each component).

Upon successful completion of this course, students must be able to:

- analyse the importance of plant tissue culture and related techniques for specific applications in agriculture and industry.
- explain, illustrate and interpret the principle of transgenesis, design of components involved and mechanism of transgene integration and expression.
- assess the methods of plant transformation and discuss their mechanisms, advantages and limitations.
- justify the application of genetic engineering in the development of transgenic plants with novel traits.
- discuss the role of plant genetic engineering in addressing the current needs of the century, addressing global challenges in food production, energy, human health, industrial needs and environmental conservation.
- appraise the potential environmental concerns associated with transgenic crops and formulate solutions.
- summarise the current advances and emerging technologies in the field of plant biotechnology.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**50%**
• Lab report:	10%
• Term paper & journal paper discussion:	20%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**50%**

SEMESTER: 1
COURSE CODE: BIOT 6003/5003
COURSE TITLE: BIOTECHNOLOGY AND HEALTH
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: This course emphasises the scientific developments that have taken place in the fields of medical and veterinary biotechnology. The information gathered from this course is essential to apply the biotechnology principles for specific actions towards human health care and animal production. **The topics include,** advanced study of Animal and human cell, tissue and organ culture and their medical applications; Genetic engineering of animal cells and their applications; Principles of tissue engineering; Stem cells and tissue engineering as research tools in drug discovery/screening and in regenerative medicine; Embryo Transfer in domestic animals and humans; Micromanipulation and **in- vitro** Fertilisation; Animal cloning; Transgenic animals, transgenic animals in xenotransplantation; Organ transplantation; Risks and safety & biohazards. Fish Biotechnology. Sequencing human genomes; Physical mapping of human genome; Cloning of Human Disease Genes; Human Gene Therapy; Pharmaco-genetics; Nanobiotechnology in medicine; Applications of biotechnology towards human population growth. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- describe the techniques of animal and human cell culture, tissue engineering and other related technologies for specific applications in health, medicine and related industries.
- explain and illustrate the principle of animal cloning, development of transgenic animals and justify their importance in scientific research and human and veterinary medical research and technology.
- explain the advancements in human genomics and justify their relevance to human health and welfare.
- examine the relevance of biotechnology towards human welfare, population control and eugenics.
- discuss the potential difficulties, risks and ethical concerns involved in biotechnological applications to humans and animals.
- summarise the current advancements and emerging technologies in medical and veterinary biotechnology.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**50%**
• Lab report:	10%
• Term paper & journal paper discussion:	20%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**50%**

SEMESTER: 2
COURSE CODE: BIOT 6004/5004
COURSE TITLE: IMMUNOTECHNOLOGY, MOLECULAR THERAPIES AND DIAGNOSTICS
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY
COURSE DESCRIPTION: This course emphasises the scientific advancements that have taken place in the fields of immunotechnology and molecular therapies and their impacts in human medicine and health. The topics include, Natural immunity, acquired immunity; Monoclonal antibodies, genetics of immunoglobulins and antibody diversity, antigen presentation; **In vivo** regulation of immune responses, B and T cell activations, hypersensitivity, mucosal immunity; Introduction to transplantation immunology tolerance, tumor immunology and vaccines; Production of human monoclonal antibodies and their applications; T cell cloning; antibody phage display; Application of T cell cloning in vaccine development; Immunity to viruses, bacteria and parasites; Genetic control of immune response; Principles and strategy for developing vaccines; Application of molecular diagnostic techniques in disease identification; Current biotechnological developments in disease diagnosis. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- explain and illustrate the types of immunity and molecular and genetic basis of immunity.
- analyse the importance of immuno-regulation in relation to disease resistance.
- evaluate approaches for the immunological interventions for treatment of diseases.
- explain the advancements in disease diagnosis and pathogen detection.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Course work assignment:	10%
• Term paper:	10%
• Lab report:	5%
• Journal article discussion:	15%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: 1
COURSE CODE: BIOT 6005/5005
COURSE TITLE: INDUSTRIAL BIOTECHNOLOGY AND BIOPROCESSING
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: This course investigates the application of biotechnology to industries including manufacturing of medicinal bioproducts, recombinant proteins, health products, biomaterials, enzymes and generation of alternative energy. The topics include Bioreactor design and operation, fermentation processes, Process optimisation, Down-stream processing; Isolation and screening of industrially important microbes; Improvement of the strains; Effluent treatment processes; Recombinant Protein expression systems; development of products, ranging from pharmaceuticals, vitamins and amino acids; Enzyme catalysis and kinetics; Methods of protein modification; Peptide engineering; Metabolic engineering; Introduction to Nanobiotechnology; Nanomaterials and Nanobiomaterials; Characterisation of Nanostructures, Nano Synthesis and Fabrication; Biofuels, Biomass conversion. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work and a final examination (50% for each component).

Upon successful completion of this course, students must be able to:

- investigate the status of biotechnology in industrial World.
- analyse the importance of industrial biotechnology to downstream processing.
- identify the novel biotechnological approaches to derive clean energy.
- explain the advancements that has taken place in protein engineering.
- summarise the developments in nanobiotechnology and their applications to human health and in the synthesis of novel industrial materials.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**50%**
• Lab report:	5%
• Term paper & journal paper discussion:	25%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**50%**

SEMESTER: 2
COURSE CODE: BIOT 6006/5006
COURSE TITLE: BIOETHICS, BIOSAFETY AND INTELLECTUAL PROPERTY RIGHTS (IPR) IN BIOTECHNOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: This course emphasises the basic ethics to be considered and practiced in biotechnology research. Research ethical standards and procedures are considered as codes and guiding principles in biotechnology research. The study topics include Ethical concerns in biotechnology; Examination of integrity and misconduct in biotechnology research; Applications of Genetic engineering – safety and ethical considerations; Ethics in genetic testing and screening; Medical safety and biosafety of Biotechnology products; Environmental release of Genetically Modified Organisms (GMOs) on biodiversity and biosafety; Impact of GMOs on Agriculture and environment; GMO foods: ethics, benefits and risks, regulations and public acceptance, labelling; Legal implications and public concerns in human gene therapy; Bio-safety Regulations and IPR (Intellectual Property Rights) Requirement of a patentable invention; Rights/Protection and Remedies against infringement. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- analyse and compare the biosafety regulations and the policies of different countries including Trinidad and Tobago.
- explain the rules of manufacture, import and export of GMOs into or out of the country.
- summarise the existing regulations on in transgenic plants and associated research.
- assess the medical safety and biosafety of Biotechnology products to humans, animals and environment.
- describe the Intellectual Property Rights associated with scientific inventions in biotechnology.
- appraise the ethical, cultural, religious and sociological difficulties in accepting genetically modified products.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Lab report:	10%
• Term paper:	15%
• Journal article discussion:	15%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: 1
COURSE CODE: BIOT 6007 / 5007
COURSE TITLE: BIOINFORMATICS
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY/PRINCIPLES OF MOLECULAR BIOLOGY OR EQUIVALENT
COURSE DESCRIPTION: Bioinformatics course reveals the science of analysing and deducing the structure and function of genes and proteins through computational methods and software and statistical tools. This is a fast developing field and therefore continuous updating and introduction new components are expected to take place frequently. This course covers, introduction to Bioinformatics-concepts; Biological databases including Protein and Gene Information Resources; DNA sequence analysis software tools, Pairwise alignment techniques, database searching, multiple sequence alignment, phylogenetics; ORFinder; Secondary structure prediction etc., Secondary database searching; Microarray data analyses; Structure prediction methods; Introduction to computational methods for protein structure prediction; Homology modeling, Computer aided drug design. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- explain and illustrate the various bioinformatic techniques for analyses of genes and proteins.
- select the right computational methods used for analyses to address problems in molecular biology and genomics.
- practice and apply various bioinformatic tools in biotechnology research and analysis.
- prepare students for more advanced bioinformatics courses involving method development.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Laboratory class: 5 hours fortnightly

ASSESSMENT:

Coursework	**60%**
• Coursework assignment:	10%
• Lab report and project:	20%
• Journal paper discussion:	10%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: 2
COURSE CODE: BIOT 6008/5008
COURSE TITLE: GENOMICS AND PROTEOMICS TECHNOLOGIES
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY OR EQUIVALENT
COURSE DESCRIPTION: This course emphasises the basic ethics to be considered and practiced in biotechnology research. Research ethical standards and procedures are considered as codes and guiding principles in biotechnology research. The study topics include Ethical concerns in biotechnology; Examination of integrity and misconduct in biotechnology research; Applications of Genetic engineering – safety and ethical considerations; Ethics in genetic testing and screening; Medical safety and biosafety of Biotechnology products; Environmental release of Genetically Modified Organisms (GMOs) on biodiversity and biosafety; Impact of GMOs on Agriculture and environment; GMO foods: ethics, benefits and risks, regulations and public acceptance, labelling; Legal implications and public concerns in human gene therapy; Bio-safety Regulations and IPR (Intellectual Property Rights) Requirement of a patentable invention; Rights/Protection and Remedies against infringement. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- investigate the advancements that has taken place in the post-genome era biology.
- explain various structural and functional genomic approaches used in contemporary research.
- describe a gene based on in-depth analysis of a genome.
- describe and practice the methods and to perform analysis of the genomics and proteomics data, and choose the relevant research tools.
- appraise the importance of genomics and proteomics and assess their applicability in multiple fields of science.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Group discussion and library: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Coursework assignment:	10%
• Term paper:	15%
• Journal article discussion:	15%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: 2
COURSE CODE: BIOT 6010 / 5010
COURSE TITLE: MOLECULAR PLANT BREEDING
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY
COURSE DESCRIPTION: This course offers an introduction to principles of molecular biology methods and tools used for plant genetic improvement and conservation of biodiversity. The covered topics include review of basic molecular biology techniques and genomic approaches in plant breeding; molecular markers, Marker-assisted breeding (MAB), Linkage mapping, QTL analysis, Pedigree-based analysis; Management of agro-biodiversity; Targeted transgene expression, Targeted gene silencing and targeted mutagenesis for crop improvement; Current advancements in transgenesis in genetic improvement of plants; Molecular phylogeny; Horizontal gene transfer in nature and their risks; Genetic and evolutionary applications to problems of restoration and conservation of biodiversity and New approaches in conservation of biodiversity. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions (GD) conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- explain how the genomic approaches and molecular tools are used for plant breeding and crop improvement.
- assess the importance of molecular marker technology in contemporary plant breeding and explain their effects citing successful examples.
- formulate a conceptual marker assisted breeding programme for a major crop of the Caribbean and a most wanted trait.
- construct phylogenetic trees and conduct studies on Molecular phylogeny.
- apply genetic and molecular evolutionary principles for restoration and conservation of biodiversity.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Group discussion/Lab: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Coursework assignment:	10%
• Term paper:	15%
• Journal article discussion:	15%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: 2
COURSE CODE: BIOT 6011 / 5011
COURSE TITLE: APPLIED BIOINFORMATICS
NUMBER OF CREDITS: 3
PREREQUISITE: BIOINFORMATICS
COURSE DESCRIPTION: This advanced course aims to provide students with knowledge, critical understanding and practical experience of using computational methods and bioinformatic approaches to interpret output data and functional genomics, genomics, transcriptomic and proteomic technology platforms. The course coverage includes Genomic sequencing and mapping Techniques; Human Genome project; Sequence Databases; Biological Databases– Primary and Secondary; Genotype databases, molecular structure databases and genome databases; PERL and Bioinformatics: Basics of PERL; Hidden Markov Models; Modelling Protein sequence families; Protein Modeling and In silico Drug Design; Protein modeling and analysis; Modeling protein structures using High Throughput methods; Virtual Library design; Structural Mining: Protein Ligand work analysis; Study of drug-interactions, Docking; Intermediate and Advanced; Evolutionary analysis; Metabolomics, Working with Discovery Studio (Molecular Modeling). The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- apply data generated by different molecular techniques to appropriate bioinformatics analytical tools and interpret results.
- develop and apply bioinformatics approaches and skills to address research questions and problems of practical relevance.
- critically evaluate the approaches and technologies employed in functional genomics research.
- demonstrate operational procedures for the commonly used bioinformatics databases and bioinformatics software packages.
- set up and complete bioinformatics project by appropriate selection and utilisation of bioinformatics tools.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Lab: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Coursework assignment:	10%
• Lab project and report:	20%
• Journal article discussion:	10%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

COURSE CODE: BIOT 6012/5012
COURSE TITLE: DIRECT READING AND SEMINAR
NUMBER OF CREDITS: 3
PREREQUISITE: N/A
COURSE DESCRIPTION: This advanced course aims to provide students with an opportunity to undertake directed reading on a selected topic of their interest or on a title/problem selected for further research (as MSc research project/MPhil research project). The topics should be related to any of the courses listed in the post-graduate programme. The teaching and learning methods involve weekly tutorial/discussion with the assigned supervisor. Assessment involves 100% course work with submissions including, concept proposal, monthly reports, seminar presentation and final write up.

Upon successful completion of this course, students must be able to:

- demonstrate an advanced level of reading on a given specific title in biotechnology. preparation and reporting
- critically analyse scientific information and literature, logically discuss and submit as a comprehensive document in a required size and structure.
- summarise and present on a topic relevant to a particular learned aspect of Biotechnology with clarity.
- demonstrate time management, scientific writing and oral presentation skills.

CONTACT HOURS:

- Tutorial/Discussion: 1 hours per week
- Lab: 5 hours fortnightly

ASSESSMENT:

Coursework:	**100%**
• Concept proposal:	20%
• Monthly reports:	20%
• Seminar:	20%
• Submitted paper/write up:	40%

SEMESTER: 2
COURSE CODE: BIOT 6013/5013
COURSE TITLE: ENTREPRENEURSHIP IN BIOTECHNOLOGY
NUMBER OF CREDITS: 3
PREREQUISITE: MOLECULAR BIOLOGY AND R-DNA TECHNOLOGY
COURSE DESCRIPTION: Successful biotechnology enterprise requires trained skilled professionals who are also knowledgeable with the complexities of biotechnology commercialisation. This course builds a required basic foundation on biotechnology enterprise and entrepreneurship, providing a venue for learners to better understand the entire biotechnology enterprise and issues unique to the industry. The goal for this course is to give non-business students the tools necessary to be totally conversant in the financial and managerial aspects of science-based businesses particularly on biotechnology. The covered topics include Macro- and micro-economics of biotechnology businesses, Entrepreneurial models and skills in developing biotechnology industries from research to market, Market research, Proposal preparation for funding – financing biotechnology ideas, Team building and leadership, Production economics and management, Branding and marketing issues, Bioethics and analysis and approval and Intellectual Property and technology transfer. The teaching and learning methods include lectures/tutorials, group discussion, journal paper discussion and assignments/term papers. The teaching and learning methods involve lectures supplemented by laboratory sessions/virtual lab/group discussions conducted through blended learning modes. Assessment involves course work (60%) and a final examination (40%).

Upon successful completion of this course, students must be able to:

- formulate strategies for a viable biotechnology industry or enterprise.
- create financial and funding strategies for success under specific economic situations.
- demonstrate principles of human interrelationships to research, design and development activities.
- navigate through schematic steps in the development of a biotechnology derived product: from its inception as intellectual property, to scale-up, to the final product.
- investigate the marketing strategies specifically related to biotechnology products.
- analyse organisational problems arising from a legal and technology framework.
- explain the issues related to bioethics in the development of biotechnology products.
- compose a road map from an idea to a final product in biotechnology.

CONTACT HOURS:

- Lecture/tutorial: 2 hours per week
- Lab: 5 hours fortnightly

ASSESSMENT:

Coursework:	**60%**
• Project:	20%
• Term paper:	10%
• Journal group discussion:	10%
• Two mid-sessional tests:	20%
Final written exam (three-hour duration):	**40%**

SEMESTER: N/A
COURSE CODE: BIOT 6014
COURSE TITLE: RESEARCH PROJECT
NUMBER OF CREDITS: 12
PREREQUISITE: N/A
COURSE DESCRIPTION: The aim of the research project is to allow the student to synthesise and articulate several aspects of the taught programme within a single themed research topic. In addition, it will provide the opportunity for further detailed skills training in aspects of biotechnology, molecular diagnostics, molecular ecology etc., It will allow the student to pursue an individual study on a particular research topic or issue of interest to the student and will incorporate technical skills training specific to the individual student. As such, the research project will provide the opportunity to develop a specific set of practical and reporting skills that will be of use to the student in their future career. The teaching and learning methods involve weekly tutorial/discussions with the assigned supervisor. Assessment involves 100% course work with submissions including, concept proposal, monthly reports, seminar presentation and final write up.

Upon successful completion of this course, students must be able to:

- demonstrate an advanced knowledge and understanding of a specific practical problem or a technical aspect of biotechnology and recognise the underlying philosophies.
- preparation and reporting
- to analyse scientific information and literature critically on the specific topic.
- summarise and present on a topic relevant to a learned aspect of Biotechnology.
- choose and optimise appropriate research and experimental methodologies during study of the problem.
- demonstrate skills in time management, scientific writing and oral presentation.

COURSE CONTENT: The individual research project is required for the MSc award. The project will be on a topic proposed by the student and agreed by the appropriate supervising faculty. The Research Project is a fundamental component of the MSc programme and this is reflected, not only in the credit weighting, but by the fact that the MSc runs for an extra 6 months (full-time) or 10 months (part-time) following completion of coursework so that the student may have the necessary time to complete the project at a high standard.

The project is an opportunity for the student to put into practice the concepts, tools and research methods learned during the programme, within a specific area of enquiry. The research project may cover any feasible aspect of Biotechnology. It may involve a pure research study toward any branch of biotechnology but limited to the available infrastructure and facility and time limits. Students are expected to consult with the Course Coordinator during the second semester with potential ideas for their research project. A list of potential projects will also be made available for those students who do not have a specific topic in mind at the beginning of the second semester. For students from outside of Trinidad, the project may be undertaken within Trinidad or in the student's home country. Each student will be assigned a supervisor from within the UWI and one external supervisor in case the research is done outside the campus. The outcome will be an extended research paper or report, as part of the degree requirements. The research project will be examined by two internal examiners and one external examiner.

The specifications for thesis structure were mentioned in the UWI STA. Graduate Studies website, http://sta.uwi.edu/admissions/postgrad/.

The submitted work has to be presented as a seminar (on 12th week) for a 45-min duration followed by a 10-min discussion. The presentation and participation in discussion and time management will be assessed by the committee and audience.

CONTACT HOURS:
Tutorial: 1 hour per week

ASSESSMENT:

Coursework:	**100%**
• Research concept proposal:	10%
• Monthly reports:	10%
• Research poster:	20%
• Research presentation:	20%
• Research paper/thesis:	40%

Additional Course Offered by the Department of Life Science

SEMESTER: 2
COURSE CODE: BIOL 6062
COURSE TITLE: BIOETHICS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: The course is designed to expose postgraduate students to a wide assay of topics from various disciplines. The field of bioethics is not dominated by a single discipline but rather it concerns cross disciplines, that is, they are both scientific and ethical. Hence this course provides the opportunity for sustained, cross-disciplinary work in the fields of biology, natural sciences, medicine, philosophy, sociology, demography and theology. It enables a student to pursue topics where life sciences and ethics converge. Some of the areas that postgraduates should have some working knowledge of and which shall be helpful while pursuing the course in bioethics include genetics, use of scientific technology, allocation of resources, philosophy of science, environmental studies and so on.

ASSESSMENT:

Coursework:	60%
Final exam:	40%

MSc Biomedical Physics

SEMESTER: 1
COURSE CODE: BIPH 6100
COURSE TITLE: PHYSICS OF THE HUMAN BODY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will show how physics is applied to improve the understanding of physical issues concerning the human body. Models will be used to aid in the quantitative analysis of biological systems using physical and engineering principles. Various examples will be used to depict these types of analyses and how the knowledge gained from them has led to advances in the biomedical physics and engineering. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Pre-testing at the start of the course i.e. a readiness assessment will be performed. Based on this assessment formative feedback will be provided within the first 2 weeks of the semester. Various methods of assessment will be used during the course.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 1
COURSE CODE: BIPH 6101
COURSE TITLE: HUMAN ANATOMY & PHYSIOLOGY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will emphasise a systemic view of the functional anatomy of the human body, anatomical locations, structure and function of the various systems of the body, physiological functions of the main components of each major system of the human body, organ systems and associated diseases. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of anatomical models, multimedia and interactive presentations.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: SUMMER
COURSE CODE: BIPH 6102
COURSE TITLE: NUMERICAL METHODS FOR BIOMEDICAL APPLICATIONS
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: The development of powerful digital computers with fast processing speeds has encouraged the use of numerical methods and simulation in problem-solving by vastly increasing the range of mathematical calculations which can be conveniently performed. Numerical methods are techniques by which a variety of real-life problems are formulated so that they can be solved using arithmetic operations. The choice of the particular formula or algorithm or model has a marked influence not only on the computer programming but also on how the final results obtained are understood. As such, this course will give the student a thorough grounding in the use of computers, and the variety of computational tools and routines used in Pure and Applied Physics in order to both broaden and deepen our understanding of physics problems.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: BIPH 6103
COURSE TITLE: WORKPLACE: SAFETY AND PROTECTION
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on electrical, chemical, biological safety and the safe use of ionising radiation in the medical environment. Electrical safety is very important in the medical environment since patients not only undergo diagnostic or treatment procedures but may also be unattended, unconscious or anaesthetised and not respond normally to an electric current. Chemical safety protects human health and the environment by evaluating chemicals for potential risk and providing tools and guidance for the use of various chemicals. Biological safety involves protecting individuals and the environment from potentially harmful microorganisms and other biological agents through the use of risk assessment and the application of work practices, protective equipment, and exposure control. Concepts, principles and units of dose in radiological safety, principles and methods of radiation protection will also be addressed. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of multimedia and interactive presentations.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 2
COURSE CODE: BIPH 6104 *(not offered in 2021/2022)*
COURSE TITLE: RADIATION PHYSICS AND DOSIMETRY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on ionising radiation as the basis for radiation therapy and for many diagnostic imaging studies. The various modes of interaction between ionising radiations and matter, energy deposition by ionising radiation in matter; concepts, quantities and units in radiological physics; principles and methods of radiation dosimetry will be addressed. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of multimedia and interactive presentations.
ASSESSMENT:

Coursework:	60%
Final exam:	40%

SEMESTER: 1
COURSE CODE: BIPH 6105
COURSE TITLE: RADIATION BIOLOGY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on effects of ionising radiation on living things. The various consequences of the interaction between ionising radiations and biological objects from energy deposition in water to cancer development and death will also be addressed. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of multimedia and interactive presentations.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 2
COURSE CODE: BIPH 6106
COURSE TITLE: RADIATION ONCOLOGY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on radiation therapy and radiation carcinogenesis. The various types of radiation for tumor treatment, energy deposition by ionising radiation in organs and tissues. Difference of response to radiation between tumors and normal tissues/organs. Principles and methods of modern and advance radiation therapy will also be addressed. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of multimedia and interactive presentations.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 2
COURSE CODE: BIPH 6107
COURSE TITLE: BIOMEDICAL IMAGING
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on construction, practical utilisation of equipment and principles for many diagnostic imaging studies. The course will include several visits to medical centre to gain practical knowledge of use the equipment and the concerns which determine implementation in various medical cases. Teaching will consist of lectures, seminars and tutorials in order to provide students with ample opportunities and methods for engaging with the course material. Presentation of lectures will employ a variety of multimedia and interactive presentations.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: BIPH 6108
COURSE TITLE: NUCLEAR AND ATOMIC PHYSICS
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course will focus on structure and properties of atoms and atomic nucleus as the basis for nuclear medicine and for many diagnostic imaging studies. Nuclear and sub-nuclear structures, nuclear reactions, the various modes of nuclear decay, as well as electromagnetic properties of elementary particles and nucleus; concepts, principles and quantities in nuclear and atomic physics with some application of quantum mechanics will be addressed.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: BIPH 6109
COURSE TITLE: MEDICAL PHYSICS LABORATORY COURSE I
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Experimentation, observation and recording skills are very necessary for Biomedical Physicists. Medical Physics Laboratory I is a modern, lab-based physics course where all the Biomedical Physics students will be exposed to a variety of techniques, concepts and skills in the experimental sciences. These skills are needed for all the other modules of the specialisation in Medical Physics and will be developed holistically through this module which focuses entirely on practical skills. This course is one of the seven courses in the Medical Physics elective providing the necessary background knowledge for the Biomedical Physics. Laboratory exercises will be mostly hands-on and team-based and will provide students with ample opportunities and methods for engaging with the course material.
ASSESSMENT:

Coursework:	100%

SEMESTER: 1
COURSE CODE: BIPH 6110
COURSE TITLE: MEDICAL PHYSICS LABORATORY COURSE II
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Experimentation, observation and working knowledge skills are very necessary for Biomedical Physicists. Medical Physics Laboratory Course II is a modern physics course where all the Medical Physics students will be exposed to a variety of techniques, associated with radiological diagnostic instruments, gain skills in measuring radiation fields, familiarise themselves with various imaging modalities and be able to compare the advantages and disadvantages of each. These skills are needed for all the other modules of the specialisation in Medical Physics and will be developed holistically through this module which focuses entirely on practical skills. This course is one of the seven courses in the Medical Physics elective providing the necessary background knowledge for Biomedical Physics. Laboratory exercises will be mostly hands-on and team-based and will provide students with ample opportunities and methods for engaging with the course material.
ASSESSMENT:

Coursework:	100%

SEMESTER: 2
COURSE CODE: BIPH 6118
COURSE TITLE: RESEARCH PROJECT
CREDITS: 8
PREREQUISITE:
COURSE DESCRIPTION: Each student will agree to investigate, with the guidance of a supervisor, a current problem from their area of specialisation: Medical Physics or Movement Analysis & Rehabilitation which will incorporate a substantive research component. In some cases, the supervisors may suggest topics however students are welcome to suggest their own topics based on their interests during the course or from existing issues at their workplaces. The student will then concentrate on acquiring, organising and analysing the project's data so as to present their findings in both oral and written form.
ASSESSMENT:

Literature review:	10%
Project proposal:	20%
Conduct of experimental work/Progress:	10%
Final presentation:	15%
Project thesis:	45%

MSc Computer Science and Technology with Specialisations in Mobile Computing and Cloud Technologies

SEMESTER: 2
COURSE CODE: COMP 6104
COURSE TITLE: ADVANCED COMPUTER NETWORKING
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course covers various aspects of computer networking: Internet design principles, congestion/flow control, network topology, routing, network security, Web, wireless, online social networks, data centers and cloud computing. The objective of this course is to build upon the basic computer networking skills learned at the undergraduate level so that students can design and modify the underlying algorithms.
ASSESSMENT:

Paper review:	20%
Term project:	30%
Final exam:	50%

SEMESTER: 2
COURSE CODE: COMP 6300
COURSE TITLE: ADVANCED INTERNET TECHNOLOGIES
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course covers the technologies, protocols and architectures of the Internet. A major focus of this course is the technology and the drive towards Service Oriented Architecture (SOA), web services and e-business. To achieve this, we will examine the extensible markup language (XML) and associated technologies as well as JSON and REST-based technologies. This is followed by exploring the technology used in web services such as web services description language (WSDL), simple object access protocol (SOAP), universal description, discovery and integration (UDDI). With this background, we will look at the concept of semantic web as well as the technologies that are being used in it. Simultaneously, another aspect of the course will look at Java-script and AJAX (Asynchronous Java-script and XML) that are used to deliver modern web-based and mobile applications. In each segment, we will also discuss the business implications of each of the protocols and their effect on application design. The objective of this course is to provide students with the tools required to design and implement advanced web-based information systems.
ASSESSMENT:

Coursework:	20%
Mid-term:	20%
Final exam:	60%

SEMESTER: 1
COURSE CODE: COMP 6401
COURSE TITLE: ADVANCED ALGORITHMS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: In this course we first review the topics covered at the undergraduate level (data structures, sorting algorithms, growth functions etc.). We then focus on performance evaluation of such algorithms, Network Flow algorithms, Graph Theory, Network Performance, Capacity Analysis, Optimisation algorithms and Resource Allocation. This course introduces students to the more sophisticate algorithms being developed for today's technologies.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 1
COURSE CODE: COMP 6501
COURSE TITLE: RESEARCH METHODS, ENTREPRENEURSHIP AND INTELLECTUAL PROPERTY
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course will introduce students to three non-technical but yet important topics, Research Methods (1 credit), Entrepreneurship (1 credit) and Intellectual Property (1 credit). The course will be taught by Faculty Members as well as invited Lecturers from industry. The objective is to provide students with the tools needed for starting a business as well as preparing them for work on their thesis.
ASSESSMENT:

Paper reports:	60%
Paper presentations:	30%
Class participation:	10%

SEMESTER: 2
COURSE CODE: COMP 6601
COURSE TITLE: DISTRIBUTED COMPUTER SYSTEMS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course explores the major issues that arise when designing and implementing distributed systems with a particular emphasis on how to deal with the shared state between separate processes within such a system. The material complements network-layer courses by building on the transport layer to provide higher level applications and services. The objective of this course is to provide the infrastructure needed for advanced information systems (database, wireless, web etc.).
ASSESSMENT:

Homework:	30%
Term project:	20%
Final exam:	50%

SEMESTER: 2
COURSE CODE: COMP 6701
COURSE TITLE: E-COMMERCE AND M-COMMERCE SYSTEMS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course will introduce students to the underlying technologies required by electronic commerce infrastructures. Various authentication, encryption and access control methods will be taught. This will be a hands-on course in which students will be required to build various components of an e-commerce site.
ASSESSMENT:

Project:	60%
Final exam:	40%

SEMESTER: 2
COURSE CODE: COMP 6801
COURSE TITLE: NETWORK AND COMPUTER SECURITY
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course covers principles of computer systems and network security. We will discuss various attack techniques and how to defend against them. A major component of the course will be the project, which will focus on building reliable code, and understanding attacks. The objective of this course is to train students in the rapidly growing area of cyber-security.
ASSESSMENT:

Coursework:	40%
Project:	60%

SEMESTER: 2
COURSE CODE: COMP 6802
COURSE TITLE: DISTRIBUTED AND PARALLEL DATABASE SYSTEMS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE:
This course covers the principles and system organisation of distributed and parallel databases. It focuses on issues of Database System Architectures, Database Design and Query Optimisation in Distributed and Parallel Database Systems. Emphasis is placed on design, implementation and management of Enterprise Database Systems. The course explores several current Database technologies including Data Warehousing, XML Databases and Web-based integration as well as emerging issues such as Cloud Data Management.
ASSESSMENT:

Paper reviews:	30%
Assignments:	30%
Final exam:	40%

SEMESTER: 1
COURSE CODE: COMP 6901
COURSE TITLE: SOFTWARE PROJECT ENGINEERING AND MANAGEMENT
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This course is designed to present students with an overview of advanced topics in Software Engineering. Students will be exposed to techniques that are gaining increasing attention in the industrial and research communities. Students will apply the software engineering techniques to homework assignments and mini-projects throughout the course. Students will also be exposed to Project Management techniques including proposals, monitoring and evaluation of large-scale software projects.
ASSESSMENT:

Project:	60%
Final exam:	40%

SEMESTER:1
COURSE CODE: COMP 6905
COURSE TITLE: CLOUD TECHNOLOGIES
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: The course helps to understand the technologies and applications of cloud computing and its virtualisation foundation used in servers, desktops, embedded devices and mobile devices. The objective is to train students for the growing area of cloud services.
ASSESSMENT:

Assignments:	60%
Project:	40%

SEMESTER: 1
COURSE CODE: COMP 6910
COURSE TITLE: WIRELESS NETWORKS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: This is a comprehensive course on wireless networks for graduate students. It surveys various wireless networking technologies and mechanisms with an emphasis on protocol design for efficient systems. Technologies covered range from personal area networks like Bluetooth to cellular wide area networks. We will cover, Bluetooth, Wi-Fi, 3G, and 4G cellular in some detail, and also survey some other technologies like Sensor and Ad-Hoc Networks. Emphasis will be on protocol design aspects for various wireless environments and traffic types. The objective is to train those who seek employment in the cellular industry.
ASSESSMENT:

Paper review:	20%
Term project:	20%
Final exam:	60%

SEMESTER: 2
COURSE CODE: COMP 6915
COURSE TITLE: MOBILE APPLICATIONS
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: Today's applications are increasingly mobile. This course teaches students how to build mobile apps for Android and iOS, two of today's most popular platforms, and how to deploy them in the Android Marketplace and the App Store. Students learn how to write native apps for Android using Eclipse and the Android SDK, how to write native apps for iPhones, iPod touches, and iPads using Xcode and the iOS SDK, and how to write web apps for both platforms. This is course will be partially taught online. Students will follow the course online but UWI faculty will evaluate course projects. The objective of this course is to train students for the rapidly growing field of mobile app development.
ASSESSMENT:

Project:	100%

SEMESTER: 1
COURSE CODE: COMP 6920
COURSE TITLE: MOBILE COMPUTING
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: As mobile phones are becoming ubiquitous computing devices, a huge number of applications are emerging. Shortly, mobile phones will become the main computing device we now use in their daily life. This graduate course covers the current trends in mobile computing systems. In particular, we will focus on the fundamental challenges of building mobile systems, as compared to traditional ones, mobile applications, enabling services and protocols, and future directions. This course covers the application layers of a mobile network environment whereas the Wireless Networks course covers the lower layers.
ASSESSMENT:

Paper review	20%
Term project	30%
Final exam	50%

SEMESTER: 2
COURSE CODE 6925
COURSE TITLE: APPLIED OPERATIONS RESEARCH
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: The purpose of this course is to study the basic tools for quantitative methods for decision-making. The emphasis is on solution methods and strategies. The course introduces the student to a wide variety of tools used in the decision-making process and demonstrates the application of these tools on real-world examples.
ASSESSMENT:

Coursework:	20%
Project:	30%
Final Exam:	50%

SEMESTER: 1 & 2
COURSE CODE: COMP 6950
COURSE TITLE: THESIS
CREDITS: 9
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONAL: A research-oriented or a novel application-oriented MSc thesis in an area under the student's specialisation. The objective is to allow students to think independently and provide a unique contribution to their field.
ASSESSMENT:

Term Project:	100%

MSc Data Science

YEAR 1 - SEMESTER 1
COURSE CODE: COMP 6501
COURSE TITLE: RESEARCH METHODS, ENTREPRENEURSHIP AND INTELLECTUAL PROPERTY
CREDITS: 3
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: This course will introduce students to three non-technical but yet important topics, Research Methods (1 credit), Entrepreneurship (1 credit) and Intellectual Property (1 credit). The course will be taught by Faculty Members as well as invited Lecturers from industry. The objective is to provide students with the tools needed for starting a business as well as preparing them for work on their research project.
ASSESSMENT:

Papers/reports (3):	60%
Presentations (3):	30%
Class participation:	10%

YEAR 1 - SEMESTER 1
COURSE CODE: COMP STAT 6105
COURSE TITLE: PROBABILITY AND STATISTICAL METHODS FOR DATA ANALYTICS
CREDITS: 3
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: This course covers fundamental probability and statistical methods necessary for understanding and conducting data analysis. Data Analytics is the process of examining data with the purpose of drawing conclusions and discovering useful information. In this science, probability theory provides the foundation for many of the fundamental data analyses and modelling techniques widely used today. Statistical methods, such as hypothesis testing, are used to draw conclusions about data and provide a foundation for more sophisticated data analysis techniques. Viewing questions about data from a statistical perspective allows data scientists to create more predictive algorithms to convert data into knowledge. At the end of this course, students will have a thorough understanding of probability theory and statistical methods which are fundamental in Data Analysis. From such understanding, students will better be able to interpret data and apply Data Analysis techniques.
ASSESSMENT:

Coursework:	**50%**
Two mid-term tests (3 hrs):	20%
Practical: 3 lab assignments	10%
Group project: written report and presentation:	10%
Assignments: participation and written submissions:	10%
Final exam:	**50%**

YEAR 1 - SEMESTER 1
COURSE CODE: COMP 6106
COURSE TITLE: STATISTICAL INFERENCE FOR DATA ANALYTICS
CREDITS: 3
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: This course is concerned with equipping students with the necessary background in statistical inference techniques that would allow them to correctly apply such techniques in data analysis. The course will be assessed with two coursework exams, weekly assignments, labs, and a final exam.
The course is aimed at those whose future careers will involve a heavy use of statistical methods and at the same time fulfil the required knowledge of mathematical statistical inference needed at the postgraduate level. Statistical inference provides a foundation for sophisticated data analysis techniques. It is essential for data analysts to have a strong understanding of statistical inference before applying these techniques.
On completion of this course students will be possess a comprehensive understanding of both Bayesian and Frequentist Inference needed to pursue further studies in Data Science. Moreover, students will also gain an understanding of the various methods through which they can validate various predictive models.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE 6925
COURSE TITLE: APPLIED OPERATIONS RESEARCH
CREDITS: 3
PRE-REQUISITES: NONE
COURSE DESCRIPTION & RATIONALE: The purpose of this course is to study the basic tools for quantitative methods for decision-making. The emphasis is on solution methods and strategies. The course introduces the student to a wide variety of tools used in the decision-making process and demonstrates the application of these tools on real-world examples.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

YEAR 2 - SEMESTER 2
COURSE CODE: COMP 6930
COURSE TITLE: MACHINE LEARNING AND DATA MINING
CREDITS: 3
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: This course covers the major Machine Learning Techniques used in data analysis. It covers supervised and unsupervised algorithms and will be assessed via coursework, a project and a final exam.
With the rise of data science and big data fields, machine learning has gained further recognition as the key driver behind the successful advance of these fields. However, many recent entrants to the field can only utilise the variety of machine learning algorithms as black boxes. This course aims to empower students to effectively use and understand the primary approaches so as to be able to modify them for specific uses. Our focus is less on theory and more on practice. Students engage in hands-on implementation of some of the fundamental algorithms such as predictive modeling and clustering applied to real, open-ended problems. While most of the course focuses on machine learning, we also have a few lectures on text/data mining algorithms.
On completion of this course students will be able to process datasets and use the extracted information to help develop key business decisions or improve various business processes.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

YEAR 2 - SEMESTER 2
COURSE CODE: COMP 6940
COURSE TITLE: BIG DATA AND VISUAL ANALYTICS
CREDITS: 3
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: This course will introduce broad classes of standard and hybrid techniques and tools for analysing and visualising data on a large scale. It elaborates on how effective analysis can be attained by computation and visualisation. Students will work in small teams to complete a research project by examining approaches for data & visual analytics.

Big data is data that is generally too large to fit into the analyst's computer. Since storage and networking are getting less costly as well as faster, big data can be transported easily to a destination where analysis needs to be done. Insights and business value can be drawn from big data. It is also useful for policy makers e.g. Government. The course aims to provide a broad understanding of big data sets, emerging technologies for these large data sets and methods of analysis of big data. On completion of this course students will be able to understand the challenges of managing and analysing big data and to be able to visualise large datasets in order to understand its structure.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

YEAR 2 - SUMMER
COURSE CODE: COMP 6005
COURSE TITLE: RESEARCH PROJECT
CREDITS: 9
PRE/CO-REQUISITES: NONE
COURSE TYPE: CORE
MODE OF DELIVERY: FACE-TO-FACE
COURSE DESCRIPTION & RATIONALE: A research-oriented or a novel application-oriented MSc research. The objective is to allow students to think independently and provide a unique contribution to their field. On completion of this project the student would have the ability to formulate a technical problem, develop an approach for its solution, determine the solution and implement the proposed solution.
ASSESSMENT:

Project:	100%

(The course will be assessed through the term project that consists of a report and presentation. Evidence that the project was implemented is also required.)

MSc Mathematics

SEMESTER: 2
COURSE CODE: MATH 6100
COURSE TITLE: ALGEBRA (GROUP THEORY AND APPLICATIONS)
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Group Theory; Commutators, Centralisers and Nomalisers; The Homomorphism Theorems; The Sylow Theorems; The Class Equation of a Group; Theory of p-groups; Solvable Groups; The Jordan-Holder Theorem; Simple Groups; Direct Product of Groups. Applications Groups and Symmetry; Group Actions on Sets; Stabilisers Symmetry Groups in Two Dimensions; Matrix Groups; Rotations of Regular Solids; Finite Rotation Groups in Three Dimensions; Polya-Burnside Theorem and applications.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6110
COURSE TITLE: REAL ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Topological spaces [Neighbourhood system, topological subspaces]; Interior closure, Frontier [Including dense and perfect sets]; Compactness; Connectedness; Metric Spaces; Continuity and Homeomorphism; Lesbegue Integral.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6120
COURSE TITLE: DIFFERENTIAL EQUATIONS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Existence and uniqueness of solutions. Linear Systems. Stability of linear and weakly non-linear systems. Second-order Differential equations. The boundary value problem.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6130
COURSE TITLE: ALGEBRA (GROUP ACTIONS)
NUMBER OF CREDITS: 4
PREREQUISITE: MATH3430 or MATH6100
COURSE DESCRIPTION: Introduction to Finite Group Theory; Groups and Homomorphism; Group Actions on Sets; Groups of Even orders; Finite p-groups; Normal Series; Direct Products and the Structures of Finitely Generated Abelian Groups; Group Actions on Groups.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6140
COURSE TITLE: ADVANCED MATHEMATICAL METHODS NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: General Theory of Eigenvalues and Eigenfunctions, The Minimum Problem, Sequences of Eigenvalues and Eigenfunctions, Variational Properties, Eigenfunction Expansions, The Rayleigh-Ritz Approximation Method. Green's Functions Inverses of Differential Operators Examples of Green's Functions, The Neumann and Robin Functions, Source Functions for Parabolic Equations. Cylindrical Eigenfunctions, Bessel Functions, Eigenfunctions for Finite Regions, The Fourier-Bessel Series, The Green's Function, Modified Bessell Functions. Spherical Eigenfunctions, Legendre Functions, Eigenfunctions of the Spherical Surface, Eigenfunctions for the Solid Sphere.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6150
COURSE TITLE: VISCOUS FLOWS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Equations of Viscous Flow Kinematics and Dynamics of Flow, Energy Considerations, Boundary Conditions, Dimensional Analysis, Reynolds Number. Exact Solutions, Some Exact Solutions including Flow Generated by an Oscillating Plate, Helical Flow in an Annular Region, Hamell's Problem of Flow in a Wedged-Shape Region, Flow Generated by a Rotating Disc. Axially Symmetric Rotary Flows, Flow between Parallel Discs, Flow between Coaxial Cones, Flow between Concentric Spheres - A Secondary Flow. Flow Past a Sphere, Creeping Flow Past a Sphere, Ossen's Criticism, Matching Techniques. Lubrication Theory, Physical Origin of Fluid-Film Lubrication, The Mathematical foundations of Lubrication Theory, Slider Bearing, Squeeze Films, Journal Bearings.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 2
COURSE CODE: MATH 6160
COURSE TITLE: AN INTRODUCTION TO NON-NEWTONIAN FLUID MECHANICS
NUMBER OF CREDITS: 4
PREREQUISITE: MATH 6150
COURSE DESCRIPTION: Principles of Continuum Mechanics, Basic Concepts, Material Derivative, Deformation Rates, Rivlin - Ericksen Tensors, Strain Tensors, Kinematics of Steady Shear Flows, Continuity Equation, Stress and Volume Force, Equations of Motion, Energy Equation. Material Properties Occurring in Steady Shear Flows; Flow Function, Normal Stress Functions. Processes that are controlled by the Flow Function; Rotational Viscometer, Pressure- Drag Flow in a Straight Channel, Radial Flow Between Two Parallel Planes, Pipe Flow, Helical Flow. Effect of Normal Stress Differences, Cone-and Plate-Flow, Weissenberg Effect, Die-Swell, Axial Shear Flow.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 2
COURSE CODE: MATH 6170
COURSE TITLE: ADVANCED DISCRETE MATHEMATICS (F-POLYNOMIALS OF GRAPHS)
NUMBER OF CREDITS: 4
PREREQUISITE: MATH 3290 and MATH 3400
COURSE DESCRIPTION: Review of Generating Functions and Solutions of Recurrence Relations using Generating Functions. General F-polynomials of Graphs, Matching Polynomials, Circuit Polynomials, Tree Polynomials and Sub-graph Polynomials. Relationships with other Graph Polynomials.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6180
COURSE TITLE: PROBABILITY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Review of Distribution Theory; Poisson Process; Finite Markov Chains; Continuous time Markov Chains; Renewal Theory; Branching Process; Epidemic Theory.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 2
COURSE CODE: MATH 6190
COURSE TITLE: NUMERICAL ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Review of Computer errors. Programming in MATLAB. Solution of non-linear equations. Numerical Linear Algebra LU and Cholesky factorisations. Pivoting. Norms and analysis of errors. Iterative methods. The matrix eigenvalue problem. The singular-value decomposition and pseudo-inverses. Approximation of Functions, Polynomial interpolation. Hermite interpolation. Spline interpolation. Best approximation: Least squares and Chebyshev. Trigonometric interpolation and the Fast Fourier Transform. Numerical differentiation and integration, Gaussian and adaptive quadrature. Numerical solution of ordinary differential equations, Existence and uniqueness of solutions. Runge-Kutta and multi-step methods. Local and global errors. Stability. Boundary-value problems: Shooting methods. Finite-difference methods. Collocation. Stiff equations. Introduction to the numerical solution of partial differential equation, Elliptic, parabolic and hyperbolic partial differential equations.
ASSESSMENT:

Coursework:	25%
Final written exam (three-hour duration):	75%

SEMESTER: 1
COURSE CODE: MATH 6191
COURSE TITLE: ASYMPTOTIC & PERTURBATIONANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Introduction to asymptotic approximations; Regular and singular perturbation methods for ordinary and partial differential equations; Matched asymptotic expansions: Boundary layer theory, outer and inner solutions with matching principles, interior layers, corner layers; Introduction to Multiple Scales: Slowly varying coefficients, forced motion near resonance, Floquet theory, Wittaker's method; Boundary layers by multiple scales; Nonlinear oscillators; Bifurcation Theory: Hopf bifurcations, weakly non-linear analysis; Two-time and uniform expansions.
ASSESSMENT:

Coursework:	**30%**
Final Exam:	**70%**
• Take-home exam:	35%
• Written exam (three-hour duration):	35%

SEMESTER: 1
COURSE CODE: MATH 6192
COURSE TITLE: ADVANCED MATHEMATICAL MODELLING
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Models from Newton's laws of motion: Planetary motion, energy conservation laws, resonance phenomena, surface area and minimal energy configurations; Lagrangian/Eulerian equations of motion: trajectories of particles, caustics; Linear stability analysis for oscillating systems, modelling of two-layer fluid systems, Rayleigh-Taylor instability; Heat flow problems: characteristic time of cooling, chemically reactive systems, convection-diffusion systems; Particle motion: Probability density functions, predicting particle positions, nearest neighbour interactions; Theory of Elasticity: Stress-strain relations, elastic and plastic deformation; Laws of interaction: Forces between charged particles, principle of superposition, electromagnetic forces, Faraday's law of magnetic induction; Interfaces and fronts: Modelling explosive systems with thin reaction zone kinetics - SHS, Frontal Polymerisation.
ASSESSMENT:

Research project (written report and oral presentation):	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: MATH 6193
COURSE TITLE: NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS
NUMBER OF CREDITS: 4
PREREQUISITE: COMPUTER LITERACY IS EXPECTED. PRIOR KNOWLEDGE OF MATHEMATICAL SOFTWARE PACKAGES SUCH AS MATLAB WOULD BE AN ASSET.
COURSE DESCRIPTION: Preliminaries: classification of partial differential equations; Well-posedness; Spatial differences: central differences; Fourier analysis; Higher order difference approximations; One-sided differencing; Temporal errors: Concepts of stability and accuracy; analysis of dispersive and dissipative error; Mostly explicit difference schemes: Forward Euler in time, Central difference in space; Lax-Friedrichs; Leap-frog (2-2) and (2-4); Concept of artificial dissipation; Lax-Wendroff; MacCormack's scheme; Runge-Kutta time stepping; Systems of equations: Decoupling; disparate speeds; Implicit schemes: Backward Euler; Crank-Nicholson; compact 4**th** order approximation for spatial derivatives; implicit schemes for systems; Semi-implicit schemes: Adams-Bashforth multi-step method; Parabolic equations and methods for their numerical solution; Numerical approximation of boundary conditions (for parabolic and hyperbolic equations): Extrapolating boundary conditions; one sided differences; linear systems; Two-dimensional problems: Operator splitting; Alternating directions implicit method; Anisotropic errors, 2-D boundary conditions.
ASSESSMENT:

Coursework:	40%
• Computer lab group assignments (4)	
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: MATH 6194
COURSE TITLE: DISCRETE MATHEMATICS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: In this course, the principles of basic Combinatorics, Graph Theory and Algebra will be developed to the more general setting of enumerative Combinatorics and Graph Theory. Students will be introduced to the notion of combinatorial identities via an exquisite blend of multinomial expansions, generating functions and recurrence relations. They will have the opportunity to utilise the Principle of Inclusion and Exclusion as well as their associated inversion formulas. More advanced properties and applications of counting numbers such as Stirling, Bell, Fibonacci and Catalan sequences will be discussed. Particular attention will be paid to the recurrence relations involved in counting systems. Generating functions will be utilised to solve the more significant graphical enumeration problems. Important results such as the enumeration of rooted and unrooted trees will be derived. A few important topics in Graph Theory that are not covered in the undergraduate course MATH 3400 (Graph Theory) will also be explored. Tutte's Theorem in planarity and the more recent developments by Thomassen leading to a proof of Kuratowski's Theorem will be incorporated. Fundamental ideas, such as the use of Kempe chains (used in proving the Four Colour Theorem) will also be introduced.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: MATH 6195
COURSE TITLE: FINITE ELEMENT ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: The main objective of this course is to clarify and explain the basic ideas on which finite element methods are founded. The focus throughout will be on the nature of the finite element method, how it works, why it makes sense, and how to use it to solve problems of interest. Throughout the course, students will be required to develop and implement numerical algorithms. Special emphasis will be placed on the efficiency and accuracy of these methods for problem solving. As this course is a practical one, students will be evaluated by their performance in coursework assignments, computer lab exams and on a final research project. Students taking this course must have a thorough understanding of undergraduate calculus and ordinary differential equations. A solid foundation in undergraduate matrix algebra will also be assumed. As students will be required to implement the algorithms on a computer, prior knowledge of elementary computer programming will be a definite asset, although this is not a prerequisite. Algorithms will be presented during lectures in pseudo code format to facilitate the creation of well-structured programs in a variety of programming languages. The numerical software package Matlab will the chosen programming tool for in-course assignments. An introductory tutorial will be organised at the beginning of the course for students with no prior knowledge of Matlab.
ASSESSMENT:

Coursework:	100%

SEMESTER: 2
COURSE CODE: MATH 6310
COURSE TITLE: COMPLEX ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COUSE DESCRIPTION: The course develops the properties of the complex number system, treated as a generalisation of the real number system. We explore the parallel analysis that results, with a particular emphasis on differentiability, analyticity, contour integrals, Cauchy's theorem, Laurent series representation, and residue calculus. Core topics include complex numbers, analytic functions and their properties, derivatives, integrals, series representations, residues, and conformal mappings. Application of the calculus of residues and mapping techniques to the solution of common boundary value problems encountered in physics and engineering applications is a major part of the course. Students are expected to have a strong background in advanced undergraduate calculus of real variables. An earlier or concurrent course in differential equations is an asset, but is not a prerequisite for this course.
ASSESSMENT:

Coursework:	**40%**
• Coursework examinations (2):	30%
• Assignments:	10%
Final written exam (three-hour duration):	**60%**

SEMESTER: 2
COURSE CODE: MATH 6
COURSE TITLE: Topology
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: This course serves as a broad introduction to the basic notions of General Topology, Metric spaces, Continuity and Homeomorphism, Compactness, connectedness and separation axioms. Students taking this course must therefore have a thorough understanding of undergraduate level real analysis.
ASSESSMENT:

Coursework:	**40%**
• Coursework examinations (2):	30%
• Assignments:	10%
Final written exam (three-hour duration):	**60%**

SEMESTER: 1
COURSE CODE: MATH 6630
COURSE TITLE: FUNCTIONAL ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: This course aims at familiarising the student with the basic concepts, principles and methods of functional analysis and its applications. The principles learnt from basic calculus and linear algebra will be developed further to the more general setting of abstract infinite-dimensional vector spaces. Students will therefore be expected to have a solid background in undergraduate calculus, real analysis, and liner algebra.
Students will be introduced to the notion of vector spaces and the distance between vectors, as well as to continuous maps between such vector spaces. This interplay between the algebraic and analytic setting gives rise to many interesting and useful results, which have a wide range of applicability to diverse mathematical problems, such as from numerical analysis, differential and integral equations, optimisation and approximation theory.

The first part of the course is devoted to a short introduction in the theory of metric spaces and to a detailed study of normed and Banach spaces and in particular to the analysis of linear operators acting upon them. The second part of the course deals with Hilbert spaces and linear operators upon them, since they play a fundamental role in applied mathematics. Finally, we look at some fundamental theorems for normed and Banach spaces such as the Hahn-Banach theorem for complex vector spaces and normed spaces and its application to bounded linear functionals; the uniform boundedness theorem, and the closed Graph theorem.
ASSESSMENT:

Coursework:	**40%**
• Coursework examinations (2):	30%
• Assignments:	10%
Final written exam (three-hour duration):	**60%**

SEMESTER: 2
COURSE CODE: MATH 6640
COURSE TITLE: THEORY OF INTEGRATION
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: In this course, we consider the limitations of the Riemann integral, and show that it is necessary to develop a precise mathematical notion of 'length' and 'area' in order to overcome these deficiencies. In so doing, we create a precise concept of measure, and use it to construct the more powerful Lebesgue integral. Finally we look at applications of measure and Lebesgue integration in modern probability theory. Students will be expected to have a solid background in undergraduate calculus and real analysis.
ASSESSMENT:

Coursework:	**40%**
• Coursework examinations (2):	30%
• Assignments:	10%
Final written exam (three-hour duration):	**60%**

MSc Occupational and Environmental Safety and Health (OESH)

SEMESTER: 1
COURSE CODE: OESH 6000
COURSE TITLE: OESH AND PUBLIC POLICY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Understanding of the complex, dynamic and delicate relationship between business pursuits, public interests and public policy. For example, fundamentals of public policy-definition, goals and objectives of public policies (regulations, legislation). People, policy agenda, policy institutions, policy formulations, policy implementation and evaluation
ASSESSMENT:

Coursework and in-course tests:	50%
Final written exam (three-hour duration):	50%

SEMESTER: 2
COURSE CODE: OESH 6010
COURSE TITLE: ADVANCED TOPICS IN OESH: MEASUREMENT METHODS AND VENTILATION
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Respiratory system; Dermal exposure; Threshold limit vales and permissible exposure limits; Instruments/equipment used in OESH, including outdoor indoor (air, dust), workplace (air, skin), source emission (both stationary and mobile sources) and noise pollution measuring techniques, in both real-time and with time-integration; Environmental and personal exposure measurements; Calibration, service and preventive maintenance; Survey preparations and performance; Field and Laboratory Analytical Methods practices; Laboratory accreditation; Certification of analysts (biological, chemical and physical measurements); General principles of ventilation, including principles of air flow, duct losses, acceleration of air and hood losses and exhaust systems; Dilution ventilation principles including dilution ventilation for; health, fire and explosion and mixtures; Exhaust Hoods-capture velocity, worker position effect and hood design factors; Air cleaning devices; Principles of exhaust system design; Acute heat disorders.
ASSESSMENT:

Coursework:	50%
• Personal and area sampling, written reports	
Final written exam (three-hour duration):	50%

SEMESTER: 2
COURSE CODE: OESH 6030
COURSE TITLE: ADVANCED TOPICS IN OESH: OESH DISORDERS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Understanding of advanced concepts of occupational safety and hygiene. For example, Chemical hazards in industries; Hazardous substances in industries and their target organs; Respiratory disorders-pneumoconiosis; chronic obstructive pulmonary disease; Occupational Illness vs. Work-Related; HIV/Aids as a work place issue; ILO Code of Practice on HIV/Aids and the world of work; Policy and legislation for impacting HIV/Aids in the workplace; ILO Conventions (Health and Safety).
ASSESSMENT:
Coursework - written reports: 50%
Final written exam (three-hour duration): 50%

SEMESTER: 2
COURSE CODE: OESH 6040
COURSE TITLE: ADVANCED OESH MANAGEMENT SYSTEM
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Advanced exposure Assessment techniques, including Self-Assessment of exposure; Exposure Assessment strategies and models, such as control banding; Delivery of occupational and environmental health services; Global warming and trans-boundary pollution transport; Hazardous waste management; Management of air quality and water resources; Basic land-use planning; Occupational and environmental audit systems; Disaster management.
ASSESSMENT:
Coursework: 50%
- Laboratory reports and in-course tests

Final written exam (three-hour duration): 50%

SEMESTER: 2
COURSE CODE: OESH 6050
COURSE TITLE: ADVANCED TOPICS IN OESH: ERGONOMICS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Advanced understanding of Ergonomics. For example, Work-Related Musculoskeletal Disorders; Evaluating Ergonomic Risk Factors; Application of Ergonomics to design of workspace and tools; Office Ergonomics.
ASSESSMENT:
Coursework: 50%
- Fieldwork reports and in-course test

Final written exam (three-hour duration): 50%

SEMESTER: 1
COURSE CODE: OESH 6100
COURSE TITLE: ADVANCED ENVIRONMENTAL HEALTH
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Advanced understanding of concepts and issues of environmental health. For example, Environmental toxicology and risk assessment; Population dynamics and geographical information systems; Environmental hazards; Indoor air quality; Ambient air quality; Soil pollution; Water pollution; Sanitation and wastewater treatment; Solid waste disposal and mining pollution; Environmental noise; Emissions control technologies for air; Environmental auditing and impact assessments; Environmental impact of tourism; National and regional guidelines, standards and regulations; International guidelines, standards and regulations;
ASSESSMENT:
Coursework: Laboratory and field studies: 50%
Final written exam (three-hour duration): 50%

SEMESTER: 1
COURSE CODE: OESH 6200
COURSE TITLE: ADVANCED OCCUPATIONAL SAFETY AND HEALTH
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Develop a deep understanding of advanced concepts of occupational safety and hygiene. For example, OSH professionals and the resources available to assist them; contemporary methods of toxicology and risk assessment of workplace hazards; contemporary issues on chemical hazards in the workplace; measurement of chemical hazards in the workplace; measurement of physical hazards in the workplace; ergonomics; occupational epidemiology; national and regional guidelines, standards and regulations
International guidelines, standards and regulations
ASSESSMENT:

Coursework:	**50%**
• Laboratory:	20%
• Field survey and report:	30%
Final written exam (three-hour duration):	**50%**

SEMESTER: 1 and 2
COURSE CODE: OESH 6300
COURSE TITLE: SEMINAR
NUMBER OF CREDITS: 1
PREREQUISITE: NONE
COURSE DESCRIPTION: Students will attend seminars or technical presentation once a week and will be required to prepare and make presentations once per semester.

SEMESTER: 1
COURSE CODE: OESH 6600
COURSE TITLE: INDEPENDENT STUDY AND RESEARCH METHODS IN OESH
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: OESH area to be chosen in consultation with a supervisor; study must be on current issues and phenomena in OESH and is designed to prepare students for a productive research Project. Learning activities include: Critical and extensive literature review, use of library and electronic sources of information; Definition of a research question; Research goals and objectives, anticipated results of study and their significance; Research methodologies and ethics, including instrumentation where applicable; Results and their interpretation, discussion and conclusions; literature cited.
ASSESSMENT:

Coursework: laboratory reports and in-course tests	50%
Research paper:	50%

SEMESTER: 1
COURSE CODE: OESH 6700
COURSE TITLE: RESEARCH PROJECT
NUMBER OF CREDITS: 9
PREREQUISITE: OESH 6600 OR EQUIVALENT
COURSE DESCRIPTION: This course is designed to prepare students to carry out research which will be both relevant and beneficial to the health and safety industry. It involves an independent research project to be supervised by academic staff members/practitioners in the OESH field. Research topics are chosen in consultation with the supervisor, based on OESH issues and phenomena of current relevance. It is expected that the resulting findings would have a positive impact on the health and safety workplace environment in the country.

Chemistry Postgraduate Research Programme

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6160
COURSE TITLE: METAL-ORGANIC CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Transition metal coordination complexes and their structural motifs; Transition metal mediated organic transformations: Stoichiometric reagents; Catalysts; Carbon-hydrogen bond activation; Training in the use of the NMR Spectrometer: Running of 31P, 1H, 13C and 19F NMR spectra; NMR Spectroscopy in Inorganic Chemistry: Structure Determination of Organometallic Compounds (using NMR and other techniques); Elucidation of Fluxional processes using NMR.
ASSESSMENT:

Coursework:	100%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6161
COURSE TITLE: PHYSICO-CHEMICAL PROPERTIES OF INORGANIC COMPLEXES
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Magnetochemistry of Inorganic complexes; the use and applications of nuclear magnetic resonance (NMR) spectroscopy in Inorganic Chemistry; the uses and applications of electronic spectroscopy in Inorganic Chemistry; the uses and applications of fluorescence spectroscopy.
ASSESSMENT:

Coursework:	100%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6260
COURSE TITLE: ADVANCED SPECTROSCOPY AND ORGANIC SYNTHESIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: NMR - understanding modern pulse NMR; Mass spectroscopy; IR and UV Spectroscopy; synthesis: retrosynthetic analysis and synthons; reagents for functional group protection and transformation; carbon-carbon bond forming reactions via electrophile/nucleophile (donor/acceptor) reactions, rearrangements, cycloadditions.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6460
COURSE TITLE: ADVANCED TOPICS IN ANALYTICAL CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Instrumental Techniques: Flow injection analysis - continuous FIA etc; Atomic Absorption Spectroscopy - Flame, Graphite Furnace etc.; Emission Spectroscopy-ICP, Optical; Gas Chromatography/Mass Spectroscopy; Chemometrics; Statistics: One-Way/Two-way ANVOA; MINITAB; T-test/F-test/Confidence Interval; Geographic Information Systems (GIS): Arch View; Modelling (GWLF); Environmental Analytical Chemistry: Water/Wastewater Quality Management - Quality parameters and standards; Theory of Water/Wastewater treatment; unit operations and processes; Solid Waste Management; Forest and Soil Conservation; Environment Impact Assessment; Natural Resilience capacity of streams; Streeter and Phelps model; Laboratory Management: Principles of Quality Assurance of chemical measurement; Guides for establishing a quality assurance programme for analytical chemistry laboratories.
ASSESSMENT:

Coursework:	15%
Final written exam (two-hour duration):	85%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6461
COURSE TITLE: ADVANCED TOPICS IN BIOANALYTICAL CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Protein Purification Methods: conventional methods, modern, affinity chromatography; Protein Separation and Quantitation: Electrophoresis, western blott, radial immunodiffusion; Antibodies: structure; purification and storage; labeling, immunoblotting; immunoassays; Enzyme Linded Immunoassay and Radioimmuno Assays Methods For Quantification of Biochemicals; Use of continuous flow systems incorporation bioreactors for the monitoring of analytes; Immobilisation of biomolecules; Bioreactor designs; Biosensors; Controlled release of drugs: use of pH sensitive and temperature sensitive polymers, electroactive hydrogels and phospholipids and matrices for controlled release of drugs; release kinetics; Kinetics of Immobilised Enzyme Systems.
ASSESSMENT:

Coursework:	60%
Final written exam (three-hour duration):	40%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6560
COURSE TITLE: RESEARCH TECHNIQUES IN CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Chemical Information Sources and Information retrieval; Format and Style of a Report - ACS Style; Operation of basic chemical instrumentation (IR, UV, Polarimeter, NMR, GC and HPLC etc.); Selected Practical Techniques for the Chemistry; Computers in Chemistry - Chemical drawing and modelling package - spreadsheet package, word processing - basic computer literacy, operating in the Windows environment; (Statistical concepts and experiment design; Data treatment; Selected Practical Techniques: Inert atmosphere techniques, purification of solvents and reagents, Analysis of alkyl lithium and organomagnesium, vacuum distillation, cooling baths, crystallisation techniques, chromatography: tic, column and HPLC, liq-liq extraction, sublimation, special reaction techniques: liq Ammonia reactions, hydrogenation, ozonolysis etc.
ASSESSMENT:

Coursework:	100%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6561
COURSE TITLE: ADVANCED TOPICS IN ENVIRONMENTAL CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Introduction to the environment; energy and cycles of energy; matter and cycles of matter; human impact and pollution; analytical techniques in environmental chemistry
ASSESSMENT:

Coursework - essays, seminar presentations	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1 AND/OR 2
COURSE CODE: CHEM 6562
COURSE TITLE: ADVANCED TOPICS IN POLYMER CHEMISTRY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Conducting Polymers, electroactive polymers, sol gel and hydrogels; Analytical application of conducting and electroactive and non-conducting polymers.
ASSESSMENT:

Coursework:	60%
Final written exam (three-hour duration):	40%

MSc Renewable Energy Technology

SEMESTER: 1
COURSE CODE: RENT 6001
COURSE TITLE: ENERGY ECONOMICS
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Students will receive basic insights into the field of energy economics. They will learn about the different markets supplying energy and the different sectors demanding energy. An understanding of the limitations of non-renewable energy sources and the problems of their substitution by renewable energy sources will be gained. The special aspects of grid-based energy markets will be discussed. At the end of the course each student should be able to understand the basic concepts of the different energy markets and the possible contributions of the different energy sources to a sustainable energy supply.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: PSMA 6102
COURSE TITLE: PROGRAMME AND PROJECT MANAGEMENT
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: The course is aligned to International Standards with the concepts and terminology as prescribed by Project Management Institute (PMI) Guide to Project Management Body of Knowledge (PMBOK) Guide. It covers the five essential project management process groups of initiating, planning, executing, controlling and closing projects. Participants will gain an understanding of the tools and techniques that can be applied to each phase of a project.
In both public and private sectors, there is an increased focus on managing projects to achieve a product/service of requisite quality, and to deliver that product/service within the approved budget and schedule. This course will provide a broad overview of the concepts and practices used managing projects in today's business environment.
ASSESSMENT:

Coursework:	40%
Final exam:	60%

SEMESTER: 1
COURSE CODE: RENT 6005
COURSE TITLE: WIND ENERGY I
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course explores the fundamental aspects of the wind resource, wind turbine aerodynamics and control, along with institutional and environmental aspects (including planning issues). An integral part of the course is a computer-based laboratory to provide hands-on experience in the design and optimisation of a wind farm. This course will also include a field trip to wind turbine site to allow the student to appreciate wind power in the real world.

Development of indigenous, renewable energy resources is critical in the drive to reduce energy cost and achieve energy security in the region. Wind power plays an important role in this movement since the wind resource in many parts of the Caribbean is favourable for wind energy development. Whether large, medium or small-scale, wind power is set to play a major part in the future energy mix of the Caribbean. Wind power technology is an interdisciplinary subject which must complement the other electricity generation methods.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: RENT 6006
COURSE TITLE: BIOENERGY I
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Humans have used Bioenergy for thousands of years. It is still the most widely used form of renewable energy. In this course students will be introduced to the fundamental concepts of what biomass is, its role in nature and for human societies, in which way it is used sustainably, how it can be converted to energy and how certain biofuel technologies can help with waste management. Bioenergy encompasses many different sources including energy crops, agricultural waste, domestic waste and animal waste, all of which are plentiful across the Caribbean region. Case studies are presented that show current practices across the Caribbean.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: RENT 6010
COURSE TITLE: GEOTHERMAL ENERGY
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course provides an overview of geothermal energy systems. An integral part of the course is the Field Trip where students gain firsthand information about different methods of measuring resistivity using equipment such as the MiniSting or the SuperSting. Field trips to specific Geothermal sites would help reinforce student understanding of the dynamic interaction of hydrothermal systems.

Many of the Caribbean islands have significant geothermal energy potential but limited technical resources in terms of trained personnel. It is therefore necessary to train persons in this area to satisfy the demands of the region in developing the science and technology of geothermal energy. This course will provide initially the necessary knowledge and skills to engage in the development of geothermal energy.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6002
COURSE TITLE: SHAPING SUSTAINABLE ENERGY SYSTEMS
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Sustainable Development is the framework within which Renewable Energy Management must be placed. The long-term goal of the MSc Renewable Energy Technology is to equip participants with the technical expertise so they can implement projects which promote self-sufficiency and sustainable development of the region. In this course, students will learn to differentiate between the competing models of sustainable development and to identify the major requirements and barriers to sustainable development of the energy system.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

COURSE CODE: RENT 6007
COURSE TITLE: ENERGY USE AND ENERGY AUDITING
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: This course is designed to enable students to assess the energy efficiency of small and medium premises, carry out energy audits and propose appropriate energy saving measures. The course comprises lectures, moderated working sessions and group exercises designed to allow the students to put the knowledge gained into practice. The whole development of Renewable Energy stems from the need to develop renewable indigenous resources and to eliminate or reduce the use of fossil fuels in the generation of electricity. This thrust can be enhanced by the efficient use of energy. An initial step is the assessment of existing systems and the introduction of energy efficient schemes. This alone can significantly reduce the electricity demand, and this must be a first step towards self-sufficiency and energy security
ASSESSMENT:

Coursework:	100%

SEMESTER: 2
COURSE CODE: RENT 6008
COURSE TITLE: ELECTRICAL INTEGRATION OF RENEWABLES
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: The integration of generators powered from renewable energy sources is fundamentally similar to that of fossil-fueled generators and is based on the same principles; but, renewable energy sources are often intermittent and dispersed (large numbers of relatively small generators) and these factors must be considered. This module applies the well-established principles of electrical engineering to the subject of integrating generators powered from renewable energy sources into electrical power systems, small and large.

Electrical integration of renewable energy is often overlooked, but is a crucial aspect of the renewable energy field. It is very common to convert energy from a renewable source into electricity. The same, of course, is true of energy from fossil fuels and the simple reason is that electricity is very convenient both to transport and to utilise. That said the design of the electrical system is rarely trivial. The proper integration of any electrical generator into an electrical power system requires knowledge of the well-established principles of electrical engineering. This course provides this very important aspect of the development of renewable energy.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6009
COURSE TITLE: HYDRO AND MARINE POWER
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: In this module the principles surrounding the generation of electricity from water will be examined. River, wave and ocean thermal resources are studied, as well as planning and environmental issues. Turbine and generator system design forms a major theme in this module as well as the thermal dynamics of ocean thermal technologies.

The Caribbean has unexplored potential for hydropower and various forms of marine power (wave and ocean thermal in particular). However, there are few persons in the region with the necessary knowledge and skills to engage in the development of these resources. This course will provide the initial knowledge and skills base to help jump-start the development of the resources.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6011
COURSE TITLE: ENERGY STORAGE
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: A major part of this course will involve investigation of the hydrogen economy and hydrogen fuel cells. Inter-island energy transportation through a Caribbean wide super grid will also be discussed as well as small-scale energy storage options.

In order for renewable energy to meet consumer demand, energy storage will become more important as grid penetration increases. Therefore, this course will explore the functioning, properties, and application of physical-chemical energy storage systems.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6014
COURSE TITLE: BIOENERGY II
CREDITS: 3
PREREQUISITE:
COURSE DESCRIPTION: Building on from knowledge gained in Bioenergy I, this module aims to cover in detail the production of energy from waste, of alcohols from micro-organisms and micro-algal systems and to cover in detail the topic of advanced conversion technologies such as pyrolysis and gasification and of special heat engines suited to the use of fuels derived from biomass/waste. A closer look at anaerobic biodigesters is performed, an area of potential benefit to the treatment of human and agricultural wastes. The principles underlying: alcohol production, energy extraction from waste, gasification, pyrolysis and the cycles of engines designed to run on fuels from biomass are covered in depth throughout this module. Students wishing to further specialise in this area will have the option of taking this course which further develops some of the topics in the first Bioenergy course and goes in-depth into the science of waste-to-energy production.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6013
COURSE TITLE: WIND ENERGY II
CREDITS: 3
PREREQUISITE: RENT 6005
COURSE DESCRIPTION: Building on wind energy I, this module aims to cover in depth (a) the advanced statistics and modelling of the resource necessary for precise assessment, (b) the aerodynamics and mechanics necessary for the design and stressing of wind turbines. Small-scale systems, electrical aspects, noise generation and offshore systems are also covered. The highlight of this course will be a wind tunnel-based laboratory investigating the loading of a small-scale wind turbine.

Students who wish to further specialise in Wind Energy technology will have the option of taking this course which expands and delves further into the technology, and modeling and setting up of a wind farm.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1
COURSE CODE: PHYS 6295
COURSE TITLE: SOLAR ENERGY CONVERSION
CREDITS: 3
PREREQUISITE: BSC PHYSICS OR PERMISSION FROM HEAD OF DEPARTMENT
COURSE DESCRIPTION: Solar Energy is the basis for other forms of renewable energy. This course therefore starts by briefly describing the main forms of renewable energy and then delves into solar energy radiation and utilisation. It describes the solar spectra and active and passive solar systems. The heat transfer characteristics are investigated and methods of estimating efficiency are outlined.

The course introduces photovoltaics (PV) and the science of the photoelectric effect. PV characteristics are defined and PV design, categories of PV modules, grid connection issues and economic analysis are explained.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 2
COURSE CODE: RENT 6012
COURSE TITLE: ADVANCED SOLAR ENERGY
CREDITS: 3
PREREQUISITE: PHYS 6295
COURSE DESCRIPTION: Building on Solar Energy Conversion, this module aims to cover in considerable depth (a) the semiconductor physics and technology involved in the design and manufacture of state of the art photovoltaic devices, (b) the design of photovoltaic components and systems, (c) advanced solar energy applications.

This will enable students to design simple PV systems, incorporating power tracking, and solar thermal systems. The module will also enable students to gain an understanding of the technology and economics of the manufacturing processes associated with the production of PV cells. One of the highlights of the course will be the design and analysis of a PV system by students via a software-based laboratory.
ASSESSMENT:

Coursework:	50%
Final exam:	50%

SEMESTER: 1/2
COURSE CODE: RENT 6000
COURSE TITLE: RESEARCH PROJECT
CREDITS: 9
PREREQUISITE:
COURSE DESCRIPTION: The aim of the research project is to allow the student to synthesise and articulate several aspects of the taught programme within a single themed research topic. In addition, it will provide the opportunity for further detailed skills training in aspects of renewable energy technology. It will also allow the student to pursue an individual course of study on a particular research topic or issue of interest to the student and will incorporate technical skills training specific to the individual student. As such, the research project will provide the opportunity to develop a specific set of practical and reporting skills that will be invaluable to the student in his/her future career.

A Research Project is a fundamental component of the MSc programme and this is reflected, not only in the credit weighting, but by the fact that the research project runs for a six-month period so that the student may have the necessary time to produce a project of a high standard.
ASSESSMENT:

Oral presentation of research project	10%
Research proposal and methodology	30%
Research thesis report	60%

MSc Statistics

SEMESTER: 1
COURSE CODE: STAT 6100
COURSE TITLE: APPLIED PROBABILITY THEORY
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Foundations of Probability; Distributions of One and Several Discrete and Continuous Random Variables; Expectations, Moments, Moment Generating Functions and Characteristic Functions; Order Statistics; The Bivariate and Multivariate Normal Distributions; Sampling Distributions; Distributions of Quadratic Forms; Poisson Process; Markov Chains and Markov Processes; Convergence in Distribution and Convergence in Probability.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1
COURSE CODE: STAT 6110
COURSE TITLE: APPLIED STATISTICAL INFERENCE
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Point and Interval Estimation; Maximum Likelihood Estimation; Hypothesis Testing; The Neyman-Pearson Theory; Likelihood Ratio Tests; The Elements of Bayesian Inference.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1
COURSE CODE: STAT 6120
COURSE TITLE: LINEAR STATISTICAL METHODS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Generalised Inverses of Matrices; Distribution of Linear and Quadratic Forms; Regression of Full Rank Models; Models of Less than Full Rank; Estimation and Tests of Hypotheses for Full Rank and Non-full Rank Models; Reduction of Sum of Squares; ANOVA for Balanced and Unbalanced Designs Components of Variance Models.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: STAT 6130
COURSE TITLE: SAMPLING THEORY AND TECHNIQUES
NUMBER OF CREDITS: 4
COURSE DESCRIPTION: Theory of Equal and Unequal Probability Sampling; Selected Topics from Simple Random Sampling, Stratified Sampling, Systematic Sampling and PPS Sampling; Ratio and Regression Estimation; Two-stage and k-stage Sub-sampling Procedures; Double Sampling Procedure; Repetitive Surveys; Non-sampling Errors.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: STAT 6140
COURSE TITLE: EXPERIMENTAL DESIGN AND ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Designs for Eliminating One-way, Two-way, Three-way and Multi-way Heterogeneity; Fixed, Mixed and Random Effects Models; Incomplete Block Designs; Factorial and Fractional Factorial Designs; Responses Surface Methods; Confounded Designs; Analysis of Covariance.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: STAT 6150
COURSE TITLE: STOCHASTIC PROCESSES AND APPLICATIONS
NUMBER OF CREDITS: 4
PREREQUISITE(S): STAT 6100
COURSE DESCRIPTION: Markov Chains; Markov processes with discrete states in continuous time; Queueing Theory; Renewal Theory; Branching Processes, Epidemic Theory.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1
COURSE CODE: STAT 6160
COURSE TITLE: DATA ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Topics selected from Trimmed Means and Winsorised Means; Transformations; Assessment of Normality; Detection of Outliers; Robust Methods; Monte Carlo Methods; Jackknife and Bootstrap Techniques; Regression Diagnostics; Censored Data Analysis; Graphical Methods of Data Analysis; Use of Statistical Software; Generalised Linear Models and Categorical Data Analysis.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1
COURSE CODE: STAT 6170
COURSE TITLE: MULTIVARIATE ANALYSIS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: Multivariate Distributions; Normal, Wishart, T and Others with Applications; Regression Correlation and General Linear Hypothesis in the Multivariate setting; MANOVA and MANOCOVA; Principal Component Analysis; Factor Analysis; Cluster Analysis; Multidimensional Scaling.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 2
COURSE CODE: STAT 6180
COURSE TITLE: ADVANCED TOPICS IN STATISTICS
NUMBER OF CREDITS: 4
PREREQUISITE: NONE
COURSE DESCRIPTION: The Bootstrap; The E-M algorithm Markov Chain Monte Carlo Methods; Empirical Bayes Methods.
ASSESSMENT:

Coursework:	40%
Final written exam (three-hour duration):	60%

SEMESTER: 1
COURSE CODE: STAT 6181
COURSE TITLE: COMPUTATIONAL STATISTICS I
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course is meant to cover the basics methods in computational statistics. Techniques such as bootstrap, jack-knife, MCMC with particular reference to both hierarchical Bayesian and Empirical Bayes will be covered. The theoretical underpinnings of the course will be covered in conjunction with relevant computational aspects. The course will be hands on and practical and will rely heavily on the statistical software R. Matlab will be utilised where there is a need for numerical computations. We will rely on both real data and simulated data for illustrating the main concepts in the course. Datasets from different subject areas will be utilised. The course is the first in a sequence of two computational statistics courses.
ASSESSMENT:

Coursework:	100%

SEMESTER: 2
COURSE CODE: STAT 6182
COURSE TITLE: COMPUTATIONAL STATISTICS II
NUMBER OF CREDITS: 3
PREREQUISITE: NONE
COURSE DESCRIPTION: This course is meant to cover the techniques in statistics that are computational in nature that would not have ordinarily been covered by the other courses in the statistics master's program. The course covers topics such as spatial statistics, advanced Bayesian models and some data mining techniques. Both the theoretical underpinnings of the material and the application through computational aspects. The course will be hands on and practical and will rely heavily on the statistical software R. Matlab will be utilised where there is a need for numerical computations. We will rely on both real data and simulated data for illustrating the main concepts in the course. Datasets from different subject areas will be utilised. The course is the second in a sequence of two computational statistics courses. This course is presented to address these concerns.
ASSESSMENT:

Coursework:	100%

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